

***Journeying from Research to Innovation:***  
***Lessons from the***  
***Department for International Development's***  
***Crop Post-Harvest Research Programme***  
***'Partnerships for Innovation'***  
***FINAL REPORT***  
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## Preface

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When the Crop Post-Harvest Programme began to implement its ‘Partnerships for Innovation’ strategy in 2002, the management team decided to commission an evaluation of this approach in order for future programmes to learn from our experiences.

From the start of this study, Andrew Barnett has been a most thorough evaluator, both in reviewing the literature and mass of documentation passed to him, and through interviews of a wide range of stakeholders in the UK and overseas. He has offered us all the opportunity to comment on early drafts of his work and this final report.

The Programme would like to thank all those who have given freely of their time and opinions to feed into this study – without which it could not have happened.

The final product, this report, is rich in experiences and lessons for future research programmes. It does not shy away from pointing out where things may have been done differently. I trust its contents will be of use to all those involved in funding, managing, implementing and monitoring/evaluating natural resources research, or innovation, programmes.

Tim Donaldson  
Programme Manager,  
Crop Post-Harvest Programme,  
NR International Limited

28 February 2006.



# Acronyms

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ADRA	Adventist Development and Relief Agency, Ghana
AEAAZ	Agricultural Ethics Assurance Association of Zimbabwe
AHP	Animal Health Programme
ANGRAU	Acharya N G Ranga Agricultural University, India
AP	Andhra Pradesh, India
APED	Association of Productive Entrepreneurs in Development, Ghana
APRLP	Andhra Pradesh Rural Livelihoods Programme
AREX	Agricultural Research and Extension, Zimbabwe
ASARECA	Association for the Strengthening of Agricultural Research in East and Central Africa
ASIST	Advisory Support Information Services and Training
BUCADEF	Buganda Cultural and Development Foundation
CAPSARD	Community Action Programme for Sustainable Agriculture Research & Development, Ghana
CARE	Co-operative for American Relief Everywhere
CBI	Crop Breeding Institute
CBO	Community Based Organization
CBOH	Central Board of Health, Zambia
CCD	Centre for Community Development, India
CEC	Centre for Environmental Concerns, India
CFC	Common Fund for Commodities
CGIAR	Consultative Group on International Agricultural Research
CHD	Community Health Development
CIAT	Centro Internacional de Agricultura Tropica
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CIP	Centro Internacional de la Papa
CIRAD	Centre de Cooperation Internationale en Recherche Agronomique pour le Developpement
CORD	Centre for Overseas Research & Development, University of Durham
CPHP	Crop Post-Harvest Programme
CPP	Crop Protection Programme
CRD	Central Research Department, DFID
CRISP	Centre for Research in Innovation Systems Policy
CSIR	Council for Scientific and Industrial Research
CTA	Technical Centre for Agricultural and Rural Cooperation
DAE	District Agricultural Extension
DE	Diatomaceous Earths
DEO	District Extension Officer
DEW	Development Wheel, Bangladesh
DFID	Department for International Development
DRD	Department of Research and Development
DTC	Development Technology Centre
ERGO	Environmental Research Group, Oxford
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FARA	Forum for Agricultural Research in Africa
FGD	Farmer Group Discussion
FMSP	Fisheries Management Science Programme
FO	Farmer Organisation
FOODNET	Food Network (of ASARECA)
FORIG	Forestry Research Institute of Ghana
FRI	Food Research Institute, Ghana
FTR	Final Technical Report
GFAR	Global Forum for Agricultural Research
GMO	Genetically Modified Organism
GRATIS	Ghana Regional Appropriate Technology Industrial Service
GTZ	Gesellschaft für Technische Zusammenarbeit

HORTEXA	Horticultural Exporters Association of Uganda
ICAR	Indian Council of Agricultural Research
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics, Patancheru, Andhra Pradesh, India
IDE(I)	International Development Enterprises India
IDRC	International Development Research Center, Canada
IDTG	International Development Group
IFAD	International Fund for Agricultural Development
IFRTD	International Forum for Rural Transport and Development
IFS	Institute of Food Science
IITA	International Institute of Tropical Agriculture, Ibadan, Nigeria
ILAC	Institutional Learning and Change
IMT	Intermediate Means of Transport
INIA	Instituto Nacional de Investigaciones Agronomicas, Mozambique
IPM	Integrated Pest Management
IPR	Intellectual Property Rights
ISNAR	International Service for National Agricultural Research
KARI	Kawanda Agricultural Research Institute
KENDAT	Kenya Network for Draught Animal Technology
KNUST	Kwame Nkrumah University of Science & Technology, Ghana
KRS	Kutsaga Research Station, Zimbabwe
LGB	Larger Grain Borer
LPP	Livestock Production Programme
M&E	Monitoring and Evaluation
MAFS	Ministry of Agriculture and Food Security, Tanzania
MGSIIRD	Mahatma Ghandi State Institute of Rural Development
MoFA	Ministry of Food and Agriculture, Ghana
NAADS	National Agricultural Advisory Service, Uganda
NAARI	Namulonge Agricultural and Animal Production Research Institute
NANGO	National Association of Non-Governmental Organisations
NARO	National Agricultural Research Organisation, Uganda
NARS	National Agricultural Research System
NASFAM	National Smallholder Farmers Association of Malawi
NBSSI	National Board for Small Scale Industries
NCAP	National Centre for Agricultural Economics and Policy Research
NFG	National Forum Group (for Rural Transport and Development in Uganda)
NGO	Non-Governmental Organisation
NISIR	National Institute for Scientific and Industrial Research
NISTADS	National Institute of Science, Technology and Development Studies
NMIMR	Noguchi Memorial Institute for Medical Research
NORAD	Norwegian Agency for Development Co-operation
NR	Natural Resources
NRI	Natural Resources Institute
NRSP	Natural Resources Systems Programme
NSI	National Systems of Innovation
NTFP	Non Timber Forest Products
NZTT	Natural Resources Development Centre/Zambia Export Growers Association Training Trust
ODA	Overseas Development Administration
OECD	Organisation for Economic Co-operation and Development
OUAT	Orissa University of Agriculture and Technology
PAC	Programme Advisory Committee
PARC	Performance Assessment Resource Centre
PCN	Project Concept Note
PCSS	Project Completion Summary Sheet
PELUM	Participatory Ecological Land Use Management
PH	Post-Harvest
PHFP	Post-Harvest Fisheries Programme
PHU	Post-Harvest Unit
PMA	Programme for the Modernisation of Agriculture

PMF	Project Memorandum Form
PPD	Post-harvest Physiological Deterioration
PREPACE	The Regional Network for Improvement of Potato and Sweet Potato in East and Central Africa
R&D	Research and Development
RD&E	Research, Development and Extension
RNRRS	Renewable Natural Resources Research Strategy
RO	Regional Office
SADC	Southern Africa Development Community
SARRNET	Southern Africa Root Crops Research Network
SAZ	Standards Association of Zimbabwe
SIDA	Swedish International Development Agency
SP	Sweet potato
SSA	Sub-Saharan Africa
TAA	Tropical Agriculture Association
TFNC	Tanzanian Food & Nutrition Centre
TRUFOOD	Trust for Rural Food and Development, Tanzania
TVE	Television trust for the Environment
UK	United Kingdom
UN	United Nations
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organisation
UNU	United Nations University
USAID	United States Agency for International Development
UZ	University of Zimbabwe
VIP	Village Infrastructure Project
WHO	World Health Organisation
WIAD	Women in Agricultural Development
WORLP	Western Orissa Rural Livelihoods Programme
ZOIC	Zimbabwe Opportunities Industrialisation Centres





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## Short Brief

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This is the final report of an exercise commissioned by NR International Limited (NRIL) to ‘learn the lessons’ from the way the £24 million Crop Post-Harvest Programme funded by the UK’s Department for International Development (DFID) has evolved over its eleven-year history from a traditional research-funding programme to one based on ‘Partnerships for Innovation’ (P4I).

Since 2002, the Programme has sought to adopt best practice associated with the achievement of innovation – the so-called Innovation Systems (IS) approach, in which research becomes just one element of a wider process of transforming ‘new knowledge’ into goods and services.

This review examined a large number of project documents, and interviewed key informants in nine countries: the UK, India, Ghana, Uganda, Kenya, Tanzania, Zimbabwe, Zambia and Ghana.

The Crop Post-Harvest Programme (CPHP) represents an exciting experiment in improving the impact of research funding. One of the more surprising conclusions is just how effective the IS approach was, even at the project level and even in very difficult environments.

This review, consistent with other evaluations, was not able to attribute quantified impacts of specific DFID-funded research projects, particularly in terms of poverty reduction. This made it difficult to demonstrate that one approach to research management has more impact than another. Despite this, the review provided *prima facie* evidence that the IS approach is more likely to lead to innovation (and thereby poverty impact) than the previous more conventional research-funding model. The Programme did appear to have considerable and wide-ranging impact, including on scientific knowledge.

The CPH Programme provides a number of important lessons about how to achieve innovation and identified some of the pitfalls to be avoided. In particular, the production of both ‘local impact’ and ‘public-good knowledge’, requires special investments, particularly in ‘learning’. Considerably more could have been achieved through targeted cross-project and cross-regional comparisons, and special activities to extract higher-level generalisations of use to others about the process and content of project implementation.

Valuable lessons were learned about ‘coalition’ formation and management, and the approach appeared relevant to a wide range of problems and countries. The key elements of the IS approach are simple, are widely understood and can be implemented effectively even at the level of individual projects. However, a hands-on approach to project and programme management is required. This requires additional expenditure, but these are ‘investments’ in the capacities necessary for innovation rather than overheads.

DFID has a significant influence on the innovation systems in which it operates, but could add substantially more value to its research investments.

Future challenges will involve identifying and utilising the UK’s own comparative advantages, and building future research funding on existing organisations in developing countries rather than setting up its own parallel systems in countries and regions.



## Summary

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S1. This is the final report of an exercise commissioned by NR International Limited (NRIL) to ‘learn the lessons’ from the way the Crop Post-Harvest Programme has evolved over its eleven-year history from a traditional research-funding programme to one funding what it calls ‘Partnerships for Innovation’ (P4I). In particular, the main aim was to determine whether this new ‘innovation’ approach was in some sense more effective than the previous more traditional approach to research management (see Annex 1 for the terms of reference).

S2. The Crop Post-Harvest Programme (CPHP) is a £24m research programme funded by the Department for International Development (DFID)<sup>1</sup>. Over the last few years, the Programme has shifted its focus so that most of the research expenditure is now spent in, and is managed by, institutions in developing countries. The Programme has taken an increasingly interventionist approach to management by actively seeking to create partnerships between governments, research institutes, NGOs and the private sector – at the level of projects these are known as ‘coalitions’. As part of this strategy, it established Regional Offices in India, Ghana, Uganda and Zimbabwe, in order to understand the local research environment more effectively and to take a more hands-on approach to project development, capacity development and monitoring.

S3. During this most recent phase, which started in 2002, the Programme has sought to adopt best practice associated with the achievement of innovation, by drawing on the literature and experience of the so-called National Systems of Innovation (NSI) approach, or more generally the Innovation Systems (IS) approach.

S4. The essential insight of the IS approach is to switch attention from “research” to the “processes of innovation” (see Chapter 4). Research becomes just one element of a wider process of transforming ‘new knowledge’ into goods and services. The IS approach emphasises the importance of:

- Understanding of the strengths and weaknesses of the system involved in effective innovation. The essential ‘systems diagnosis’ can be as simple or complex, as resources allow and depending on where the boundaries are set;
- Involving a wider range of key actors and institutions that are necessary for successful innovation (not just researchers and their organisations). Effective innovation requires a shift of power from a narrower to a wider set of actors;
- Continuous two-way communication between these actors so that the users and suppliers of new knowledge effectively understand each others’ needs;
- The context of rules, institutions, and infrastructure that constrain and facilitate the innovation process. International trends that are operating against poor people in renewable natural resource systems make successful innovation difficult, particularly at the level of projects.

S5. The essential prediction following the adoption of the innovation approach is that the nature of the research will change. Change will result from the continuous interaction between researchers and other elements of the innovation system and as a

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<sup>1</sup> <http://www.cphp.uk.com/aboutcphp/default.asp?step=4&pid=1>.

consequence of the shift in power over resources from a narrower to a wider set of actors. Such change requires a very flexible and evolutionary approach to programme finance and management.

S6. As part of this review, a large number of project documents have been examined and a large number of people have been interviewed in the nine countries visited: the UK, India, Ghana, Uganda, Kenya, Tanzania, Zimbabwe, Zambia and Ghana (see Annexes 3 and 4). The huge variability in project types and the conditions in which researchers operate provides richly textured evidence from which useful lessons can be learned. The overwhelming impression is of a great number of skilled and dedicated people doing important work<sup>2</sup>, often under difficult conditions, in which many of the features of National Systems of Innovation are deteriorating, particularly in Africa (see Chapter 5).

S7. The main findings of the review are described in this summary chapter, with more specific conclusions set out in the final chapter, Chapter 12. Chapter 1 provides an introduction to the study. The approach to the review is set out in Chapter 2 and this is followed in Chapter 3 by a brief history of the Crop Post-Harvest Programme. Chapter 4 summarises the essence of what has come to be known as the Innovation Systems Approach. Chapter 5 sets the context in which the CPH Programme's research has taken place, by mapping some of the elements in the National Innovation Systems of four of the main countries in which the Programme has operated. Chapter 6 describes the main evidence gained during the review. The 'lessons' from this experience are then presented in five chapters, each concentrating on a particular audience: lessons for the operation of coalitions in Chapter 7; lessons for research funders in Chapter 8; lessons for research Programme managers in Chapter 9; lessons for UK research institutions in Chapter 10; and, in Chapter 11, lessons for the Governance of Research.

## Major Findings

### *An Exciting Experiment*

S8. The Crop Post-Harvest Programme certainly represents a most exciting experiment to improve the impact of research by fundamentally changing the way research is contracted and executed – in effect moving from 'research' to 'innovation'. The Programme has broken new ground by enabling research institutes to work in different ways and often for the first time in formal relationships with the private sector and NGOs. These changes probably represent irreversible improvements in the way research is conducted.

S9. One of the more surprising conclusions of this review is just how effective the IS approach was even *at the project level* and even in very hostile environments. It may well be that, as this environment deteriorates, projects have to do much more themselves if change is to be successful. Yet there is a growing sense that the innovation approach has its greatest policy relevance at the sectoral or product level, precisely because the problems are often so sector-specific.

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<sup>2</sup> Thanks are due to many people, particularly at NR International, but also researchers, administrators and government officials in the countries visited. Without such unstinting help, this report would not have been possible. While every attempt has been made to weigh the evidence and to reflect people's opinions, those errors that do remain are the responsibility of the author alone.



S10. A related ‘synthesis’ study shows that many of the elements that make up the ‘Innovation Systems approach’ have been increasingly incorporated within the other DFID Renewable Natural Resources Research Strategy (RNRRS) Programmes as the emphasis on ‘poverty impact’ has strengthened in recent years<sup>3</sup>. However, this synthesis study suggests that the development of these elements has been unsystematic. As the CPH Programme demonstrates, using the IS approach provides both an essential clarifying framework and clear policy directions.

#### *A Major Change in the Conduct of RNR Research*

S11. The uniqueness of the CPH Programme was noted by the recent evaluation of the whole DFID RNRRS which described it as “a brave and novel departure”<sup>4</sup>. There is certainly evidence of a dramatic transformation of the Programme over time. It has moved from a mode of operation in which scientists largely define what is important to research, to a Programme of more wide-ranging (and equal) partnerships, where the various actors contribute their differing expertise to a commonly agreed purpose. Important scientific knowledge has been created, but equally, important knowledge has been gained about the pros and cons of different ways of working. Genuinely innovative work has taken place, and it is particularly timely given the changes going on in DFID to improve the effectiveness of research funding.

#### *Difficulty in Quantifying Poverty Impacts*

S12. However, this review, together with the much larger study involved with the RNRRS Evaluation, faced considerable difficulty in quantifying the impact of DFID-funded research, particularly in the area of poverty reduction. Without this kind of evidence of impact at the project level, it is particularly difficult to demonstrate that one approach has more impact than another (see paragraphs 167 and 170). This is not to say that there are no impacts. Many impacts were found and are described in Chapter 6, but these were often qualitative, diffuse, cumulative over long periods of time, and difficult to attribute to individual research inputs. What poverty impacts there were appeared limited to those farmers, processors and traders directly involved in the research projects.

#### *Qualitative Evidence Suggests IS Approach Does Increase Impact*

S13. However, despite the lack of quantitative evidence of impact, the review provides *prima facie* evidence that the new approach is more likely to lead to innovation (and thereby poverty impact) than the previous, more conventional research-funding model. This conclusion was strongly supported by almost all the people interviewed (the main exceptions being researchers in the UK, see paragraph 171). This support is not surprising, given that the approach itself is based on the experience of achieving innovation in a wide range of countries and sectors. What is surprising is just how many ‘obvious’ partnerships had not been formed before, even if the parties knew each other well, and that it needed a more proactive intervention by Programme management to seek out and catalyse the coalition partners (see paragraph 296).

S14. Chapter 6 provides a large number of cases where the major components of the innovation approach led to a wide range of significant impacts. These impacts include

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<sup>3</sup> Rath, Amitav and Andrew Barnett, Innovations systems: concepts, approaches and lessons from RNRRS, RNRRS Synthesis Study No 10, The Policy Practice Limited, discussion draft, 23 November 2005.

<sup>4</sup> Although they went on to say that “the jury must be regarded as still out as to whether the benefits outweigh the transaction costs”. Paragraph 4.5.6

policy change, institutional learning, changes in practice, and scientific knowledge of relevance to the scientific community, extension services and NGOs. The Chapter also shows a number of other projects where it would appear the lack of impacts were in part explained by constraints within the innovation system (and indeed where impacts may well have been more extensive if the IS approach had been adopted). The main findings of the review are summarised below:

*If the Objective is Impact then the CPH Programme has Demonstrated and Documented the Process*

S15. If DFID wants its research investment to result in poverty reduction in the near future, attention has to be paid to the processes for harnessing new knowledge in poverty-reducing development – namely the innovation systems. The CPH Programme provides a wealth of material and experience about how this can be done at the level of projects and sub-sectoral programmes. Many of the processes and procedures are already documented.

*Many Lessons have been Learned and Pitfalls Identified*

S16. Despite the relatively short period in which the Innovation Systems approach has been applied, the CPH Programme also provides a number of lessons about how the process could be improved and pitfalls can be avoided. These include:

*Achieving ‘Local Impact’ and ‘Public Goods’ Requires Special Efforts*

S17. As projects become more focused on local poverty impacts, there is a concern that they become little more than relatively marginal ‘development’ projects, prompting the question as to whether they are indeed ‘research’. The extent to which they are research depends on their design, and their ability ‘to produce generalised lessons of relevance to others’. However, there were examples within the Programme that show that a great deal of this public-good knowledge is present, and that particular efforts (and probably specialist staff) are required to extract it. These public goods concern both the process (how to improve the innovation process) and the content.

*Institutional Learning was Considerable but More Value Could be Achieved*

S18. One of the major claims for the innovation approach is that it produces ‘institutional learning’ and this was a major output mentioned in the Logical Frameworks of many CPH coalition projects. There was evidence of a great deal of this type of learning (particularly in the sense of research groups working together with the private sector and NGOs in ways that they had not done before and in ways that enabled quite different methods of working). However, the processes for turning this type of learning into public goods (for instance, by writing ‘institutional histories’) were generally not successful within the CPH Programme. Where they were successful, for instance in the CPH Programme in India, additional funds and external specialists were hired to extract these lessons. While some institutional learning takes place through ‘action research’, it is necessary to use these experiences to generate and document the evidence necessary to encourage change at the policy level.

*Value can be added through Targeted Cross-Project and Cross-Regional Learning*

S19. The project approach (and possibly the processes of competitive tendering) appeared to militate against producing international public-good knowledge that would have been extracted through comparing different projects from a number of different

countries<sup>5</sup>. Many projects operated as if they were ‘stand alone’, even if they were conceived as being part of a planned sequence of activities. Again, this tendency could be countered by setting strategic objectives at the Programme level covering these issues, by specific funding, and by engaging specialist staff to do this (see paragraph 266). Some activities along these lines are now being undertaken, and others might usefully follow under future programmes.

### *The Need to Go Beyond Written Instructions*

S20. While there was a striking level of ownership of the ‘Partnerships for Innovation’ approach and ‘coalition projects’, there was also considerable variability in understanding about what the new approach really involved. It probably would have taken more time than was available, for project and Programme staff fully to understand what the Innovation Systems approach entailed. In large part, this can be explained by the pressure to get projects approved and operating. The Programme put considerable effort into producing guidelines and providing training. However, there were limits to what could be achieved in the time available. Furthermore, it became clear that some types of knowledge are difficult to codify into guidelines, and in these cases, there is probably no substitute for using the tacit knowledge of experienced people. This proved to be particularly true with writing project proposals, final project reports and institutional histories. These all required experienced people (often with social science skills) rather than detailed sets of guidelines.

### *Valuable Lessons were Learned about Coalition Formation and Management*

S21. The Programme generated considerable experience about the pitfalls associated with partner selection and about the management of coalition projects. There is a clear trade-off between adding partners too early and finding that they are not able to deliver, and leaving it too late, thereby missing important views at the initial stages of problem specification. Attracting partners with the competencies required for innovation is more important than just increasing the number of partners. Partner selection should be driven by an assessment of the ‘comparative advantage’ of each actor. The costs of managing coalitions and participating in networks needs to be fully costed and resourced.

### *Critical Mass and the Need for Larger Projects*

S22. The need to involve additional players in innovation coalitions, combined with the need to attain a critical mass of effort, suggests that there should be larger projects, if not full ‘programmes’, rather than, project-funding. Budget constraints meant that many partners’ contributions were very part-time, and projects lasted only two to three years.

### *Is the IS Approach Relevant to all Problems and Sectors?*

S23. While it might be expected that the Innovation Systems approach was most applicable to the introduction of ‘machines’, the CPH Programme showed that it was also effective in the introduction of new ways of doing things, and in achieving policy change (paragraph 330). However, as the innovation process proceeds through time, some actors will need to be more involved than others. This might be said to be

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<sup>5</sup> For instance, there was useful experience with informally vended foods in a number of countries. It would appear that there were important common lessons coming out of this, both about the coalition approach and about what worked and what did not work. Efforts are now being made to extract these lessons. Another common theme might cover the large number of projects that introduced small-scale agro-processing machines.

particularly so for ‘agenda setting’ research that maps out areas that policy makers and others may not have thought about. However, the essence of the IS approach is that, in priority setting and the allocation of research and other resources, a wider range of actors and experience is required.

#### *Is the IS Approach too Complicated?*

S24. It is certainly the case that the IS approach is more complicated than administering a passive research-grant programme. However, the CPH Programme’s experience shows that the passive approach is probably no longer an option if the objective is impact through innovation. The CPH Programme’s experience demonstrates the necessity of an interventionist approach to the formation of coalitions, that innovation requires capacities to be strengthened at many parts of the ‘system’, and that engagement between the public and private sectors has to be facilitated. Yet the CPH Programme also demonstrates that the key elements of the IS approach are simple, widely understood and can be implemented effectively even at the level of individual projects.

#### *Country-Level Representation in Programme Management*

S25. The CPH Programme’s adoption of the IS approach demonstrated the need for Programme management to be flexible enough to evolve as more experience is gained. A decentralised form of Programme management was tested through the creation of Regional Offices. This proved to be highly successful and it is certain that the Programme’s effectiveness was partly due to the close contact that the Regional Offices were able to maintain with the situation on the ground. This enabled them to adapt rapidly to the changing situation, to participate actively in the formation of coalitions and to provide mentoring advice about project proposals, the new approach and, indeed, aspects of running coalitions.

#### *Is the IS Approach too Costly?*

S26. Certainly there are additional costs associated with the proactive interventions necessary to bring key actors to work together and to strengthen the weaker elements of the system to facilitate innovation. However, there is some confusion about the costs involved. In most cases, these are not ‘overheads’ that need reducing, but rather ‘investments’ in capacities that are necessary for innovation. The costs may be high, but the costs of not doing it are higher – “invest now or pay later”! Only in those innovation systems that are well resourced and operating effectively is a reactive approach to research funding possible.

S27. There are also costs involved with the competitive tendering approach, and these were increased by the CPH Programme’s requirements. Some of these costs were reduced by the combination of short concept documents preceding full proposals. Some other costs were reimbursed. In future, such costs could be lowered by having larger projects and longer projects. Nevertheless, such costs remain a major problem for many partners, including the private sector, which cannot afford the time to participate in lengthy meetings.

#### *The CPH Programme’s Experience has many Implications for Research Donors such as DFID*

S28. The CPH Programme was both constrained and enabled by the procedures and mechanism adopted by DFID, but DFID’s funding is itself constrained by its internal rules, not least about the limits set on the relationship between centrally funded

programmes and its country programmes. This suggests that it either should define its objectives in relation to the instruments available to it, or attempt to widen the range of instruments. These issues are explored in Chapter 8.

### *The Question of Going Beyond 'Research' Projects*

S29. Examination of conditions in the countries in which the CPH Programme operated showed severe weaknesses in their National Innovation Systems, even in India, where huge research capacities often appeared constrained by bureaucracy. This experience, together with the wider innovation systems literature suggests that the 'research project' mode of financing may well not be the most appropriate instrument for bringing science and technology to bear on poverty reduction. In such cases, the approaches pioneered by DFID's Governance Programmes, such as their 'Drivers of Change' approach might offer more direct and effective interventions. Such analysis draws attention to the incentives, disincentives, and questions about whose (research) priorities are to be met, and who wins and who loses from the process.

S30. In addition, a number of projects' efforts to innovate were constrained by their inability to cover the risks that the private sector is exposed to when trying to commercialise new technology or approaches. It will be a challenge to find ways of financing these activities and for DFID to decide how far along this route it is prepared to go in such public/private partnerships.

### *Strengthening Capacity is Necessary*

S31. The necessity of strengthening capacities has run through many of the conclusions of this study. DFID rules and procedures have made this difficult in the past. A major challenge still remains as to whether to strengthen existing institutions within developing countries or to set up parallel facilities at the regional or international (including UK) level. Interviewees in Africa clearly felt there was no alternative but to build capacities at the national level, not least as these are the elements of the system that need to absorb and implement new knowledge, even if it were generated regionally.

### *Separating Research Fund Management from Doing Research*

S32. A related question is whether to continue the separation of the management of research from doing research. While this arrangement has not been without its critics and problems of implementation, the separation has been successful and provides more flexibility in implementing an Innovation Systems approach. The innovation literature attaches considerable importance to the role of 'intermediary organisations' and the balance of power relations between the supply side and the knowledge side of the innovation system. This is probably easier to achieve when fund management is kept separately.

### *The Issue of Research Governance*

S33. The CPH Programme Advisory Committee (PAC) has documented the lessons learned and provided many useful conclusions. The CPH Programme was the only one of the RNRRS Programmes to expand the membership of its Programme Advisory Committee to include people from developing countries. More generally, this is in keeping with the IS approach, which suggests that successful innovation requires changes in the governance of the research programmes to prevent 'capture' by any one particular interest group, and particularly to strengthen the voice of what might be called the 'users' of new knowledge. This implies the need for wide representation on future PACs both in the UK and in country or regional programmes.

*Public Goods and the Issue of Access*

S34. While one of the objectives of DFID centrally funded research is to produce ‘public-good knowledge’, there is considerable confusion about what this means in practice. Many researchers say they face conflicting incentives: either to share their knowledge or to publish in journals that help their careers but are largely unavailable in developing countries. This situation needs to be resolved by DFID. At the least, contractual arrangements should be put in place to ensure that, if research outputs are not published within a fixed period after the research contract ends (such as a year), then their Final Technical Report (that must contain the main results of the research) and associated data sets can be placed on the web by the Programme.

*DFID’s Role in Global and National Innovation Systems*

S35. The devolvement of responsibility for the bulk of the aid programme to DFID offices in developing countries, together with the trend to budgetary support, and reduced head counts sets a difficult context in which centrally funded research can operate and have an impact. Many researchers felt that DFID itself was, and should be, a major component of the innovation system in which they operate, but over the period of the RNRRS, DFID has largely abrogated this responsibility. This left three major gaps: links between research funded by DFID’s Central Research Department with DFID’s other activities in developing countries; the lack of ‘ownership’ of the results of DFID-funded research that is necessary for feeding them into the international development process using the networks in which DFID is involved, *qua* UK government; and systematic cross-programme efforts to learn from experience and use the knowledge gained to strengthen the evolution of the programmes. Hopefully, these issues will be addressed in DFID’s forthcoming “Science and Innovation Strategy”.

*The Challenge of Identifying and Utilising the UK’s Comparative Advantage*

S36. The project portfolio sheds important light on the very positive contributions that British-based research has made to the CPH Programme over its life. These are discussed in more detail in Chapter 10. Given their relatively high cost, there is a pressing need for UK institutions themselves and for DFID more generally to define where their comparative advantage lies, and to find mechanisms through which this asset can be best maintained and used in the future development by itself and its development partners.



# 1 Introduction

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1. The British Government provides funds through the Department for International Development (DFID) for research in the area of Crop Post-Harvest. This Programme is managed by NR International Limited. The aim of the Crop Post-Harvest Programme (CPHP) is to increase and strengthen the livelihood options of poor households, in rural and urban areas of developing countries, for whom food crops – cereal, oilseeds, legumes, root crops and horticulture – offer a route out of poverty<sup>6</sup>. Some £24 million has been invested so far.

2. The CPH Programme aims to increase and strengthen the livelihood options of poor households, by funding research and extension to:

- Reduce post-harvest losses through reduced perishability, more effective storage and handling, and improved access to transport;
- Identify and exploit market opportunities and remove constraints to market access;
- Reduce drudgery and release labour for on- or off-farm activities through more efficient processing;
- Improve the quality of, and add value to, primary crops through processing technologies and improvements in storage and handling;
- Improve opportunities for on- and off-farm employment through backward and forward linkages in the agricultural sector and the development and management of small enterprises;
- Strengthen pro-poor innovation systems;
- Strengthen the (post-harvest) information market;
- Upscale (post-harvest) research findings;
- Provide tools for packaging and delivery of (post-harvest) information<sup>7</sup>.

3. Over the past ten years, the CPH Programme has evolved what it describes as “a new research paradigm, which emphasises the important of understanding and working with national institutional systems in order to convert research into successful innovation” (the CPH Programme web site <http://www.cphp.uk.com>).

4. According to the current Logical Framework, the purpose of the CPH Programme is that “national and international crop post-harvest innovation systems respond more effectively to the needs of the poor”<sup>8</sup>. Furthermore, the Logical Framework suggests that indicators showing that this purpose has been achieved will be that “by 2005, a replicable range of different institutional arrangements which effectively and sustainably improve access to post-harvest knowledge and/or stimulate post-harvest innovation to benefit the poor has been validated in four regions”<sup>9</sup>.

5. The purpose of this report is to examine this evolution and to add value to it by extracting the positive and negative lessons that can be learned from the various

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<sup>6</sup> Executive Summary, CPHP Annual Report, 2003–4, page iii.

<sup>7</sup> <http://www.cphp.uk.com/aboutcphp/default.asp?step=4&pid=21>.

<sup>8</sup> CPHP Logical Framework (2002–2005). This has now been extended to 2006 and is currently under revision and will be reported in the quarterly reports to DFID’s Central Research Group.

<sup>9</sup> As footnote 8.

approaches that have been used, particularly from the traditional form of research contracts, through to the current ‘coalition approach’ to project design and implementation. In essence, the traditional model can be considered as contracting research institutes to carry out research, while the coalition approach engages both the ‘suppliers’ of new knowledge and the ‘users’ of new knowledge in a joint endeavour to solve problems and implement the solution within its institutional context.

### *The Questions to be Addressed*

6. The overarching question is whether the new approach is in some sense more effective than the previous one. This requires a comparison of essential elements of both the new and the older approaches, and an examination of the context in which the Programme has operated. However, this question leads on to another, which is more fundamental: what is the purpose of DFID’s investment? As we shall see, during the course of the Programme, DFID changed its view of the purpose of its investment, from the generation of new knowledge, to more general concerns about its ‘impact’, particularly on poverty reduction. So the question is whether the new approach is more likely to result in poverty-reducing impacts than the previous approach.

7. These questions of ‘impact’ are notoriously difficult to answer. In addition to the well-known problems of ‘attribution’ between research inputs and outcomes<sup>10</sup>, the short lapsed time between the start of the CPH Programme’s new projects in 2002 and this review limits what can be expected in terms of observable change.

8. More fundamentally, DFID’s funds usually form only a small part of the resources currently going into any particular national system of research and innovation. It therefore becomes difficult, if not impossible, to ascribe any particular outcome to DFID’s input alone.

9. While it was recognised at the outset that it was unlikely that it would be possible to determine quantitative links between inputs and outcomes in statistically significant terms, this study is premised on the notion that important qualitative lessons can be drawn from these different approaches, both about what seems to work and about what does not. The aim was therefore to go beyond projects and regions to the level of the whole Programme in order to derive “higher-level generalisations” about the “lessons learned” that may be useful for research funders, research managers, researchers and the other key actors in the process of generating and applying new knowledge to reduce poverty.

10. This attempt to learn lessons from the CPH Programme’s experience, and indeed the activities of the Programme itself, have been given added importance by the fact that it has taken place when DFID (and other agencies) are reconsidering how science and technology can best be applied in the fight against poverty, and when DFID is itself changing the way it supports research<sup>11</sup>. During the course of this study, it has been possible to feed some of the CPH Programme’s experience into this process, and into the major evaluation of the Renewable Natural Resource Research Strategy that took place

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<sup>10</sup> These are explored in DFID’s recent Research Policy Paper: Surr, Martin (team leader), Andrew Barnett, Alex Duncan, Melanie Speight, with David Bradley, Alan Rew, John Toye, Paragraph 240. ([http://www.DFID.gov.uk/Pubs/files/pov\\_red\\_pol\\_paper.pdf](http://www.DFID.gov.uk/Pubs/files/pov_red_pol_paper.pdf)).

<sup>11</sup> DFID Research Funding Framework 2005–2007, <http://www.DFID.gov.uk/pubs/files/researchframework/research-framework-2005.pdf>.



during 2004/2005<sup>12</sup>. It is hoped that this final report will provide a valuable resource to DFID and other research donors and also to the managers of future research programmes.

11. It has been suggested that this review looks at the problem from the point of view of researchers and those that manage and fund research<sup>13</sup>. This is probably inevitable given its origins and the way that DFID allocates its resources to 'research'. Yet, if the focus is on innovation, there are many other perspectives that need to be taken into account, particularly those that 'use' research. Certainly there is a 'market' for knowledge, with numerous suppliers and users, wholesalers and retailers. The perspectives of these different actors would no doubt merit more attention, not least in demonstrating how other aid instruments available to country programmes could contribute to improving the impact of research and increasing poverty-reducing innovation.

12. It should be stressed at the outset that, while care has been taken to weigh up conflicting opinions and other evidence, it is inevitable that many of the lessons learned are based on the subjective judgements of the author and have benefited from hindsight. It is hoped that these judgements are presented constructively, and in good faith. In all cases, the researchers and other people who were interviewed were very helpful, hard-working and serious people. It is also the case that many of these criticisms apply with equal or greater force to other programmes funded by DFID and other donors.

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<sup>12</sup> Evaluation of DFID Renewable Natural Resource Research Strategy, June 2005, EVD 659.  
<http://www.dfid.gov.uk/aboutdfid/performance/files/ev659-cover.pdf>.

<sup>13</sup> Frank Almond, member of CPH Programme Advisory Committee, comment on an earlier draft.



## 2 The Approach to the Review

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13. The initial question was whether the ‘Partnerships for Innovation’ approach was in some sense better than the more traditional approach to funding and managing research. It was hoped that this could be approached by examining two samples of projects: the first sample was examined in 2003 and 2004 and included projects that were designed prior to the major shift in emphasis that took place in 2002. A second sample was examined in 2005 and constituted so-called ‘coalition’ projects that started at the end of 2002<sup>14</sup>.

14. An initial concern was that ‘coalition projects’ examined in the second phase would not have had insufficient ‘lapsed time’ to enable them to demonstrate observable impact. This proved to be the case, even though the extension of DFID’s contract with NR International for a further year enabled the second phase of the review to take place in 2005, rather at the end of 2004 as was originally envisaged.

15. It was also important for the review to establish at an early stage:

- what were the essential elements of the new ‘Partnerships for Innovation’ approach, and the extent to which this approach contained the elements of best practice contained in the ‘innovation’ literature; and
- the context in which the Programme operated, in relation both to the national context in which the projects were carried out and to the changing perspective of DFID and its requirements.

16. During the initial phase of the review, an attempt was therefore made to develop a common language with NR International’s UK and regional staff<sup>15</sup> about what is meant by ‘Partnerships for Innovation’, ‘coalitions’ and the National Systems of Innovation literature. Background papers were prepared and a training exercise conducted at the annual meeting of the CPH Programme Regional Co-ordinators that took place in South Africa in June 2003<sup>16</sup>. Furthermore, a policy brief was prepared summarising the National Systems of Innovation literature. This brief forms the basis of Chapter 4 of this report. During the course of the review, advice has been given to the CPH Programme’s staff on a number of issues concerning innovation in general, and about ‘institutional learning’ in particular. While these interactions will be interpreted by some people as compromising the independence of the review, it is important to stress that this was a lesson-learning exercise rather than an evaluation. The primary purpose of the review was to go beyond evaluations of individual projects to derive “higher-level generalisations” about the “lessons learned” from the whole Programme.

17. Visits were made to Ghana (October 2003 and September 2005), India (November 2003 and June 2005), Uganda (February 2004 and October 2005), Kenya (October 2005), Zimbabwe and Zambia (May 2005) and Tanzania (February 2004). A large proportion of the CPH Programme’s 155 projects were examined, including all of the 16 ‘Partnerships

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<sup>14</sup> See Annex 1 for the initial terms of reference and approach. The extension of the RNRRS Programme for an additional year provided an opportunity to carry out the review of ‘coalition projects’ in 2005, rather than 2004 as had originally been envisaged.

<sup>15</sup> Regional staff are contractually consultants.

<sup>16</sup> See, for instance, Barnett, Andrew, Towards a common understanding of key NSI terms: a personal view, CPHP, May 2003.

for Innovation' projects started after 2002. Interviews were guided by a checklist of questions (see Annex 4). In addition, as part of the research, an attempt was made to develop a matrix that would summarise each project according to a number of indicators of 'project impact', together with indicators of the extent to which the projects contained characteristics that experience suggests are likely to contribute to successful innovation – 'their NSI-ness'<sup>17</sup>. This was not successful. The results of these activities are described in Chapter 6.

18. While it was not possible to reduce the subjective nature of the approach, efforts were made to 'triangulate' the results by consulting widely and by subjecting draft reports and interview notes to key informants. In addition, the interviews were carried out on a confidential basis. This means that in some cases it has been necessary to make a point without naming a specific source for the information or without naming the specific project to which the comment was directed. The point is to extract the lessons not to attribute blame. While each example cited might not provide 'definitive evidence' of a phenomenon, collectively they do represent the honestly held views of at least some of the people interviewed.

### *The Evolution of the Review*

19. The plan during the initial phase was to undertake a subjective examination of the older projects using the perspective of (using the 'lens' provided by) the 'innovation system' approach (see Chapter 4). The aim was to try to explain subjective impressions of success/failure in terms of the existence or absence of the various elements of the innovation systems (and partnerships) in which the activity took place.

20. It was recognised from the beginning that projects in the first phase of the Programme may well be successful in terms of innovation and impact, even if the inputs to the process are not seen by the participants as forming part of a 'knowledge or innovation system'. Such successes, and indeed failures, were in part due to the existence or absence of the other parts of the 'system' necessary for successful innovation. This proved to be the case. Similarly, while the Innovation Systems approach may require coalitions of partners, clearly the existence of partnerships does not necessarily imply the adoption of an IS approach.

21. However, it became clear during the first-stage reviews that it was impracticable to focus solely on the pre-2002 projects during these initial interviews. The post-2002 projects were almost entirely continuations of earlier projects funded by the CPH Programme. So it became impossible to separate outputs and impacts from the pre- and post-2002 projects. Many of the participants in these older projects are also engaged in the current round of coalition projects and were keen to talk about them. Indeed, many respondents had difficulty in distinguishing between the large number of projects funded by the CPH Programme (and other funders), and the various phases of the projects with which they had been involved. This is itself an important insight: from the viewpoint of a number of researchers, each 'project' forms only a small part of their own research agenda. They may obtain their funding from a number of sources at the same time (not least the government funding of their own institution) and see each 'project' as contributing to a larger and longer-term research endeavour.

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<sup>17</sup> The inelegant term 'NSI-ness' refers to the literature on National Systems of Innovation; however, as this review proceeded at the project level, the emphasis on 'national' systems was dropped in favour of the term Innovation Systems.

22. Nonetheless, the second follow-up field visits to Ghana, India, and Uganda in 2005 focused almost exclusively on projects that were implementing an Innovation Systems approach.



### 3 A Brief History of the Programme

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#### *The Changing Motivations and Context of DFID-Funded Research*

23. The CPH Programme is a £24m research Programme funded by the Department for International Development. It has changed significantly along a number of different dimensions since it first started in April 1995. Initially the emphasis was on ‘research’ and the need to contribute above all else to the production of ‘scientific publications’<sup>18</sup>. Subsequently, greater emphasis was given to the impact of research on poverty reduction, on the dissemination of research results, and, more particularly, on the uptake of the research by poor people themselves.

24. The history and evolution of DFID’s Renewable Natural Resources Programme are now well known and are described in some detail in the recent evaluation of the RNRRS<sup>19</sup>. The evaluators suggest that the Strategy as set out in the so-called “Yellow Brick”<sup>20</sup> was “envisaged to support field RNR projects and programmes being undertaken by DFID” (paragraph 3.4.2). Although the Programme was demand-driven, “initially the demand for research seems to have been identified more by the UK research community itself ... or by certain more upstream target organisations” (paragraph 5.6.3). As time went on, and particularly following the DFID White Paper, DFID’s emphasis turned to demonstrable poverty reduction. The evaluators believe that all Programme Managers and the Programme Advisory Committees responded effectively to the new challenge (paragraph 4.2.2). “Programmes have ... initiated work on uptake and capacity building as a direct response to being committed to achieving research outputs focused on securing poverty reduction” (paragraph S59). However, “with [DFID’s] holistic emphasis on poverty eradication it may have reduced its contribution to more basic research in this field” (paragraph 4.2.4). Since the 1997 White Paper, “all Programmes have increasingly incorporated a mix of specific projects, or built appropriate aspects into projects, to support strengthening of the enabling environment, including explicit support for policy, institutions and associated processes” (paragraph S59).

25. The evaluators reflect a widely held view that the RNRRS framework has been characterised by the “changing political aims within DFID as a whole” (paragraph 4.2.1) and has undergone a string of internal reorganisations, including untying the requirement that DFID research funding had to be managed by UK institutions.

26. From the innovation perspective, it is particularly important to note the RNRRS Evaluations finding that:

*In 1994, RNRRS was primarily a Programme envisaged to support field RNR projects aid programmes being undertaken by DFID. The policy changes that have occurred since then (5.6 and 7.2) mean that this natural DFID constituency,*

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<sup>18</sup> “These changes in emphasis and focus have been partly developed through programme activity and reviews, but also prompted by the changing agenda at DFID. The latter has often had quite major impacts on the type of research undertaken and the characteristics of research outputs”: Marter, A D, Analysis of recent marketing research undertaken by the CPHP: an overview, Final Report, NR International, November 2002.

<sup>19</sup> Evaluation of DFID’s Renewable Natural Resources Research Strategy (RNRRS) 1995–2005 by Dunstan Spencer, Stein Bie, Ursula Blackshaw and Anne Thompson with ten subject matter specialists, June 2005.

<sup>20</sup> The Yellow Brick is the short-hand name given to the RNRRS Strategy Document prepared by DFID in 1994 that set out the agenda for the 1995 – 2005 period. ODA, Renewable Natural Resources Strategy 1995–2005, Final Report, Research Task Group. May 1994.

*through which uptake, capacity building and other impacts could be achieved, no longer exists. (3.4.2)*

*[during the evaluation it became] apparent that all programmes have needed to initiate strategies to resource the enabling environment, within which the outputs of their research are framed. Programmes and projects are now building in support to the enabling environment including institutional support, and capacity building, and direct support into market led uptake of research findings. It is a challenge for programmes to balance this since the resourcing, for these built in inputs, is insufficient to be able to generate a sustainable enabling environment. (3.4.5).*

27. These drivers of change within DFID are set to continue with the trends towards increasing budget support (rather than project or sectoral aid), and the policy to separate responsibilities for particular aspects of the aid Programme between DFID's UK offices (such as the programme funded by the Central Research Department) and their offices within developing countries.

28. In addition to these parochial changes, it is important to stress that there have been much larger global trends that have been diminishing the role of agriculture in development and seen downward shifts in the national capacities in specific countries, especially in Africa, in particular in extension services. This has also impacted negatively on the uptake of research and its subsequent impact. Such changes also determine what it is sensible for DFID (or any other donor) to do when investing in research.

29. Although DFID did not use the specific language of innovations in the 1997 or 2000 White Papers, they did contain many of the ideas. However, as DFID's thinking has evolved, these terms have been used explicitly and with growing frequency in DFID's recent research-strategy documents and consultations<sup>21</sup>. Although this trend is dismissed by some commentators as just another DFID fad<sup>22</sup>, this probably is based on a misunderstanding, as the innovation approach is largely a summary of historical best practice rather than a new hypothesis. Furthermore, this approach could now be said to be the dominant paradigm in research funding for most Organisation for Economic Co-operation and Development (OECD) countries (including the British Government's Department for Trade and Industry) and has recently been adopted by the New Partnership for Africa's Development (NEPAD) Ministers of Science and Technology, and various elements of the Consultative Group on International Agricultural Research (CGIAR) system.

30. DFID's most recent statement about its attitude to the Innovation Systems approach was made in their response to an electronic consultation on their proposed Strategy for Research on Sustainable Agriculture (SRSA). They say that:

*DFID recognizes that research is only one component of agricultural innovation processes. For agricultural research to have real impact strong linkages into*

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<sup>21</sup> See, for instance, Surr, Martin (team leader), Andrew Barnett, Alex Duncan, Melanie Speight, with David Bradley, Alan Rew, John Toye, DFID Research Policy Paper, Research For Poverty Reduction, paragraph 240 ([http://www.DFID.gov.uk/Pubs/files/pov\\_red\\_pol\\_paper.pdf](http://www.DFID.gov.uk/Pubs/files/pov_red_pol_paper.pdf)). See also "For agricultural research to have real impact strong linkages into innovation that lifts people out of poverty are crucial. These linkages include demand appraisal and problem identification, participatory research, site-specific validation of outputs and effective promotion of outputs" (paragraph 11, Consultation on DFID research funding framework: Synthesis of Comments and DFID response by the Central Research Department, 7 September 2004).

<sup>22</sup> See, for instance, the views of British researchers reported in the RNRRS Evaluation, page 372, and Pound, B and B Adolf, Research capacity development, desk study for DFID, NRI, draft, August 2005..



*innovation that lifts people out of poverty are crucial. These linkages include demand appraisal and problem identification, participatory research, site-specific validation of outputs and effective promotion of outputs. The regional programmes will need to assess the effectiveness of these linkages with respect to the research they fund and to find ways of strengthening them where necessary. Hence it is to be expected that each regional Programme will develop differently<sup>23</sup>.*

### *Changing Concepts of the Research Process*

31. These changes within DFID also reflected more general changes within the wider community of donors and development thinkers. Over the past ten years, many agencies have stressed the need for more equal ‘partnerships’ in all aid relationships, including those between northern and southern researchers. Stress was placed on ‘local’ involvement, the need to ‘build local capacities’, and the processes rather than just the product of research<sup>24</sup>.

32. During this time, there has also been an important process by which DFID divested itself of its own dedicated ‘tropical’ research institutes and introduced a competitive tendering model, which reached its conclusion with the ‘untying’ of DFID research grants from UK institutions in 2000. Over the period covered by the Programme, the proportion of funds going to UK institutions, or expatriate institutions more generally, has declined.

33. This decline is not restricted to the CPH Programme, as all RNRRS programmes have shifted their funding from the UK. According to figures supplied by DFID to the House of Common Select Committee on Science and Technology, the proportion of DFID research projects contracted to UK-led groups has fallen from just under ninety percent in 1999–2000, to just over fifty percent in 2003–2004. However, these figures do not state what proportion of funds is spent in Britain. Nor are these trends universal. As the following table demonstrates, the position varies considerably between programmes. DFID support to health research, for instance, continues to be contracted exclusively through UK institutions.

**Proportion of DFID Research Projects Contracted to UK-led Groups**

Research Area	1999–2000		2000–01		2001–02		2002–03		2003–04	
	Number of contracts	% UK-led	Number of contracts	% UK-led	Number of contracts	% UK-led	Number of contracts	% UK-led	Number of contracts	% UK-led
Health	19	100	12	100	11	91	6	100	1	100
Engineering	42	100	59	96	70	95	34	97	18	94
Renewable Natural Resources	152	87	100	74	54	52	78	51	33	54
Economics/Social/Political Science	10	100	100	98	36	100	38	86	14	85
Education	2	100	23	100	11	90	1	100	3	66
Source: DFID; cited by the House of Commons Science and Technology Committee, The Use of Science in UK International Development Policy Thirteenth Report of Session 2003–04 Volume I, Table 7										

<sup>23</sup> Paragraph 11: DFID Response to Electronic Consultation on the proposed Strategy for Research on Sustainable Agriculture, 2005, <http://www.dfid.gov.uk/research/srsa-response-final.pdf>.

<sup>24</sup> Typical of these trends is the much cited Swiss Commission for Research Partnerships with Developing Countries (KFPE), Guidelines for Research in Partnership with Developing Countries, which was published in 1998.

34. It seems that three trends have been responsible for this shift: the greater emphasis on partnerships; the high cost of keeping expatriates overseas; and the untying of British research budgets (although this latter change is relatively recent and is said to have little impact so far on the location of funds). These forces resulted in an increasingly large percentage of funds being spent in developing countries, by local partners, allowing greater local partnership and local leadership in strategy, direction and execution.

35. A major touchstone of ‘equality in partnerships’ that has emerged in the past few years is the extent to which all partners have a knowledge of, and even a say in, the allocation of each project’s research budget<sup>25</sup>. Many researchers in developing countries that were interviewed for this review reported that, for a substantial period in which the Programme has operated, they did not know the details of the project budget, nor the process by which the funds had been allocated between the various ‘partners’. There was a widespread feeling that, in the early years, they were often treated as research assistants or contractors in someone else’s research, but, over the years, they had become to feel more like equal partners in a mutually beneficial relationship.

#### *Major Changes within the CPH Programme*

36. At its start in 1995, the thrust and nature of the Programme was shaped by the fact that the research was mainly carried out and managed by the Natural Resources Institute (NRI). Many projects continued research started prior to 1995. NRI, and its predecessors since 1894, had been part of a department of government, undertaking research on ‘tropical products’ and natural resources related to developing countries.

37. From 1996, the management of the Programme was transferred to NR International Limited (NRIL), a specially created limited liability company owned by the Universities of London (Imperial College), Greenwich, Wye College and Edinburgh, when NRI itself was finally sold to the University of Greenwich. The move was seen by many key informants as being highly controversial and many reasons have been suggested for it. Some people suggest that the creation of NRIL was mainly driven by the need to reduce the overhead cost of the operation, while others suggest that it was to emphasise the arm’s length relationship between the managers of the funds and some of its largest contractors, namely NRI, Imperial College and Edinburgh University.

38. Interviews with NRI staff involved at the start of the CPH Programme indicated that, in so far as they sought partners in developing countries at this initial stage, they did so with those who were largely self-financed, in order to maximise the income flow to NRI during its transfer from DFID to the University of Greenwich<sup>26</sup>. This was understandable and is reflected in the budgets of early projects, which show, not only that NRI was the major beneficiary of DFID CPH funds, but also that a very large proportion of the money allocated to each project was spent on NRI staff. The important contribution that NRI and

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<sup>25</sup> Jacques Gaillard was perhaps the first to argue that the touchstones of equal power relations were involvement in the conceptualisation of the project, knowledge of all elements of the budget, and ultimately control of budgets and quality assurance: see his North–South research partnership: is collaboration possible between unequal partners?, *Knowledge and Policy*, 7(2), 1994, pp. 31–63.

<sup>26</sup> The people expressing this view are now retired from NRI. Current staff who were also involved at the time state that “this was not a criterion used for selecting partners”. “In 1996 DFID decided not to shut down NRI (an organisation it fully owned) but to ‘sell it’ to the ‘highest bidder’ based on a predicted business plan. The major feature of that plan was the future income NRI was likely to receive from the RNRRS. This was then greatly affected by [DFID] who untied aid with all the implications this had on flow of money to UK organisations. NRI (and UoG) in good faith and with goodwill to the development process has had to deal with this” (A Westby, personal communication, 3 January 2006).

other British scientists have made to the CPH Programme is explored in subsequent chapters.

39. These early beginnings were traumatic for many of the people involved and this has cast a long shadow over the subsequent Programme, but the Programme has also undergone many other substantial changes over its history. Some of these have been reactions to the changes in DFID policy already described and NR International's interpretation of them, and instructions from DFID advisors. Others resulted from internal Programme reviews and from changes in strategic thinking initiated by the Programme Advisory Committee, the Programme's Managers and their consultants.

40. In the early stages of the CPH Programme's funding, priorities were set out in the Yellow Brick and subsequently modified through a series of 'country framework documents' drawn up in line with national agricultural research and development policy and the results of needs assessments carried out by the Programme. These set out research needs both in terms of a 'production systems approach' and for particular commodities (crops) described in the Yellow Brick. Each production system had its own Production System Leader, who in all cases was an academic in a British University or NRI (or University of Greenwich from 1996). It is suggested that the initial frameworks tried to balance the portfolio between strategic and adaptive research.

41. More recently, and following the creation of regional offices, priorities have been set according to Regional Strategies<sup>27</sup>, which locate new research in the institutional context of the countries in which they operate<sup>28</sup>. Priority research themes were discussed with local stakeholders in 2002 and are documented in the 2002–2005 Regional Strategies. Furthermore, regional staff have been able to influence research policy through discussions at the national level. For instance, the CPH Programme's regional consultants have put the case for partnerships in the Uganda National Agricultural Research System (NARS) reforms and contributed text on institutional reforms in the final document. Clearly, the existence of skilled staff in a country raises the possibility of extending this policy work within each Region to assist in mapping national CPH innovation systems and to propose actions for strengthening them<sup>29</sup>.

42. The East and West African Strategies give extensive and clear descriptions of the way the future research is to be managed – namely using the coalition approach – but say rather less on what needs to be researched, or how the national system of innovation relating to CPH might be strengthened. The process followed by each Region is shown graphically in the figure on the following page from the CPH Programme's Annual Report for 2002–03.

43. Since its inception in 1995, the CPH Programme became increasingly aware of the importance of the institutional context of its work and the need to engage effectively with a wider range of actors in project commissioning and implementation. For the CPH Programme with its pro-poor focus, engaging with the institutional context of its work was

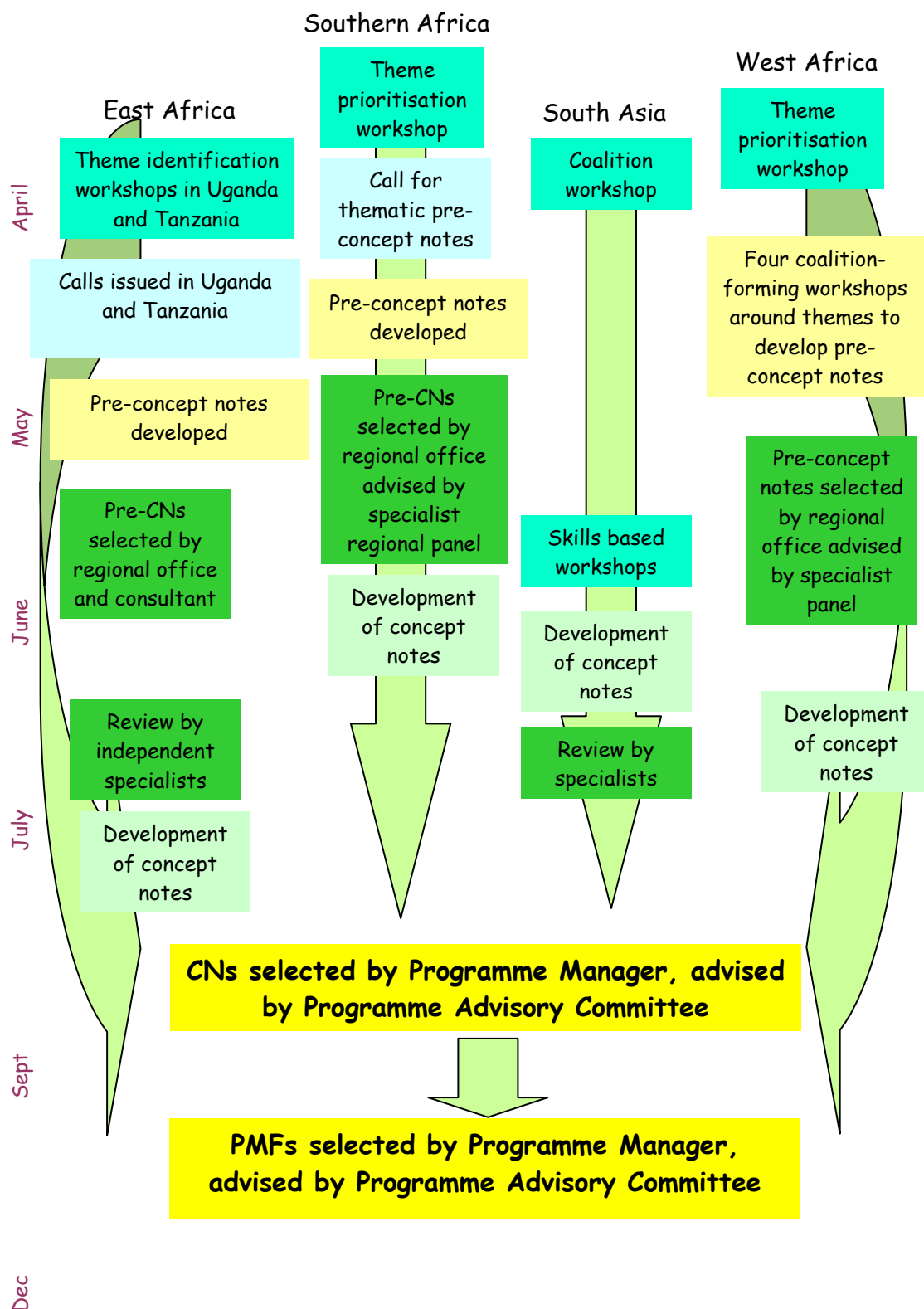
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<sup>27</sup> See, for instance, The Regional Strategy for CPHP in West Africa 2002–2005, page 3.

<sup>28</sup> From time to time, CPH Programme Management has also commissioned thematic reviews to see whether further research in particular areas was required.

<sup>29</sup> The DFID Crop Post-Harvest Programme in East Africa Strategy for 2005–2006.

considered essential if the Programme was to bring about pro-poor Post-Harvest



**Figure 1. A diagrammatic representation of the development of the Partnerships for Innovation projects during 2002 in the four regions**

Source: CPH Programme's Annual Report 2002–03, Figure 2.2

innovation<sup>30</sup>. By 2002, the CPH Programme's annual report stated "that the key to maximising the impact of [its] research on the livelihoods of poor households is investment in institutional change"<sup>31</sup>.

44. Interestingly, the recent RNRRS Evaluation came to similar views by concluding that "whilst being increasingly demand-led in its activities (paragraph 5.5, 5.2) [RNRRS programmes] can only adopt a supply-push approach to uptake. This is neither effective nor efficient" (summary paragraph S19).

45. In 2001–2002, the CPH Programme negotiated a new "research management paradigm" with DFID. The organisational and institutional context was seen as a key determinant of research impact, and not just an 'assumption'. In the language of Logical Frameworks, institutional development became the Programme's Purpose, livelihood impacts became its Goal, and the contractual deliverables, the production and dissemination of new knowledge, remained unchanged<sup>32</sup>.

46. The CPH Programme does appear to have been the first of DFID's research Programmes formally explicitly to change the way it manages the research process. A recent 'synthesis study' looking across the whole RNRRS Programme found that, while all the Programmes had evolved in broadly similar ways, there was wide variation between the Programmes and it was largely an *ad hoc* process<sup>33</sup>.

47. This change in research management accelerated the shift in the proportion of funds that were spent in developing countries. Simultaneously, there was a major shift in power relations, with more funds being controlled by developing countries themselves. In particular, current CPH Programme's projects require that "core partners can see all project management information (financial and other)"<sup>34</sup>. Of the 16 projects commissioned in 2002–03, one was entirely UK-led, 11 were overseas led and four were jointly led<sup>35</sup>. The RNRRS Evaluation confirms the break with the past represented by the CPH Programme and suggests that it has "led to the research becoming more open to responding to local demand, with the CPH Programme acting as facilitators to the process" (see paragraph 5.6.6).

48. It is suggested that the crop post-harvest systems necessitate this approach, possibly even more than other sectors, for two reasons. First, the transformation of farm products to products in the market place involves systems that are themselves extremely varied and

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<sup>30</sup> "The term 'Institutions' can be used in a number of different ways. It covers two important elements:

(a) organisations or agencies that operate within both the public and private sector; and  
(b) the mechanisms, rules and customs by which people and organisations interact with each other (i.e. the "rules of the game")."

There is often some controversy about the definition of institutions. "There are some situations in which organisations, (a), are excluded from the definition, with the definition being restricted to that provided by (b). However, in a number of domains organisations are often referred to as 'institutions' (e.g. financial institutions, charitable institutions etc)". See DFID's Sustainable Livelihoods Guidance Sheets, [http://www.livelihoods.org/info/info\\_guidancesheets.html](http://www.livelihoods.org/info/info_guidancesheets.html). This source also provides examples of each type of 'institution' and guidelines for 'institutional analyses'.

<sup>31</sup> CPHP Annual Report 2002, page 1.2

<sup>32</sup> CPHP Annual Report, April 2004, page 1.3.

<sup>33</sup> Rath, Amitav and Andrew Barnett, Innovations Systems: Concepts, Approaches and Lessons from RNRRS, RNRRS Synthesis Study No 10, The Policy Practice Limited, discussion draft, 23 November 2005.

<sup>34</sup> See CPHP web site.

<sup>35</sup> CPHP Annual Report, November 2004, page 6.1.

complex; and second, building profitable ventures in this area is likely to require complementing narrow sectoral- or commodity-based approaches with a wider understanding and management of the institutional context<sup>36</sup>.

49. It is difficult to attribute change to particular individuals, as many people, including those in the Regional Offices, contributed to the process of change in the CPH Programme. However, in terms of documentation, it appears that Frank Almond, a member of the PAC and Partnership Advisor, circulated a note in July 2000 widening his brief from NGO partnerships to the wider institutional context, with particular reference to the private sector. While he accepts these ideas derived from discussions with many other people, his notes of visits to Regional Offices in November 2000 contained all the essential elements of what was to become the 'coalition approach': including criticism of the 'linear' model, interaction between different participants, innovation mechanisms and institutional histories. Part of these notes say that:

*Projects that move beyond scientific research and into questions of marketing and uptake will also start to encounter an even wider variety of partners. Such a variety of partners – from civil society organisations, NGOs, private sector, public policy sector etc – will be extremely diverse, will have different languages, will have different sets of agendas, and will be looking at a project with different interests in mind. The project setting represents an intersection of interests from all of these agendas. ... It would seem that a solution would be for the Regional Coordinator to retain someone to both undertake that task and to encourage project partners to become more adept at doing it themselves. Again, all the arguments are for that to be a locally-recruited skill<sup>37</sup>.*

50. Dr Andy Hall, until recently regional co-ordinator in the Programme's South Asian Regional Office<sup>38</sup>, also provided much of the intellectual underpinning and justification for the changes that took place<sup>39</sup>. He came to the Programme with an extensive understanding of the literature on research systems, and the factors determining the success and failure of these systems to induce change<sup>40</sup>. Dr Hall was able to utilise the resources of the Programme to investigate and demonstrate these ideas, and to pilot many of the approaches that were later incorporated into the CPH Programme's approach in other countries<sup>41</sup>.

51. Andy Hall believes his own views were deeply influenced during his time in Uganda, where it became clear that scientists needed to partner with other organisations if they were

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<sup>36</sup> Frank Almond, CPHP Partnership Advisor, personal communication.

<sup>37</sup> Frank Almond, extracts from personal file notes, personal communication, 22 November 2005.

<sup>38</sup> NRI has pointed out that "The 'partnership for innovation' approach was built upon concepts that an NRI staff member (Andy Hall) introduced to the CPHP. It is in many ways an evolution of the way that NRI had in general been doing business. It is an approach that NRI has promoted in post-harvest work funded by other donors e.g. Gates Foundation funded work on orange fleshed sweet potato processing and marketing", personal communication Prof A Westby, 3 January 2006.

<sup>39</sup> Andy Hall's first publication using the innovation systems idea was in 1998: Hall, A J, M V K Sivamohan, N Clark, S Taylor and G Bockett, Institutional developments in Indian agricultural R&D systems: the emerging patterns of public and private sector activity, *Science, Technology and Development*, 16(3), 1998, pp. 51–76.

<sup>40</sup> Particularly the work of Professors Chris Freeman, and Norman Clarke during his PhD at the Science Policy Research Unit at Sussex University.

<sup>41</sup> Many of these documents and subsequent summaries are to be found on the website: <http://www.cphpsouthasia.com/cphp.asp>.



to be effective<sup>42</sup>, but he regards as seminal the work on public–private partnerships in horticulture. This was funded out of the CPH ‘programme development’ budget in 1998 and published as “Horticultural R and D in India”<sup>43</sup>. It was the first time he had used the IS concept. This work, together with all the work in India, was strongly influenced by inputs from both Dr Rasheed Sulaiman and Professor Norman Clark. This initial report resulted in the funding of a series of ‘case studies’ as the key to moving the argument forward and producing the evidence. Some members of the PAC were said to be very supportive of this approach from its early stages.

52. It now seems likely that these ideas that were circulating within the CPH Programme’s management and elsewhere were re-enforced by the recommendations of an independent review commissioned by the CPH Programme’s management that was carried out by Biggs and Underwood<sup>44</sup>. This explicitly used the language of IS and advocated changing the Programme’s Logical Framework to reflect fully a commitment to a “systems approach”. Probably the interaction with Andy Hall provided Biggs and Underwood with a language (the language of IS) in which they could express views that they (at least in the case of Biggs) had propagated for many years using somewhat different language<sup>45</sup>. This resulted in the Programme developing its ‘Partnerships for Innovation’ strategy and a “coalition approach to post-harvest management and design”.

53. Biggs and Underwood’s recommendations were implemented through a significant shift in the Programme’s approach that took place in April 2002. Central to the new approach was support for, and exploitation of, appropriate groupings of actors in its projects, seeking to do so in ways that fostered a pro-poor institutional environment for post-harvest innovation. Above all else, the new policy required a far more interventionist role for NR International as Programme manager. In addition to specifying the topics of future research (following guidance from DFID and the PAC), the Programme became involved in specifying the process by which the research would take place, and in supporting the teams to meet these new requirements.

54. Since 2002, some £8 million has been allocated to these ‘coalition projects’, which aim to go beyond ‘mere dissemination’ to “taking forward relevant outputs from [CPHP’s earlier] portfolio” (costing some £16 million) and developing relationships that will “live beyond CPHP” after 2006. The new partnership approach is intended to enable project teams to identify and address those factors in the “enabling environment” that affect the uptake of research and the eventual impact on livelihoods. Even if the Programme cannot address all the interventions that are identified, the coalitions are expected to be able to work with other stakeholders to assemble the resources and actions required<sup>46</sup>.

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<sup>42</sup> This was published some four years after he left Uganda as Hall, A J and S Nahdy, New methods and old institutions: the “systems context” of farmer participatory research in national agricultural research systems. The Case of Uganda, ODI Agricultural Research and Extension Network (AgREN) Paper No 93, January 1999.

<sup>43</sup> This was published as the ODI Agricultural Research and Extension Paper No 111, 2001: Hall, A J, N G Clark, Rasheed V Sulaiman and Sarah Taylor, Institutional learning through technical projects: horticultural technology R&D systems in India, ODI Agricultural Research and Extension Network (AgREN) Paper No 111, January 2001.

<sup>44</sup> Biggs, Stephen and Mary Underwood, Review of the crop post-harvest research programme: partnerships and innovation systems, September 2001.

<sup>45</sup> While Biggs and Underwood’s report addresses the ideas of ‘partnerships’, ‘innovation’ and ‘coalitions of partners’. The Concise Oxford Dictionary defines coalitions as “a temporary alliance for combined action”.

<sup>46</sup> CPHP Annual Report, 2002, page 1.2.

55. As IS theory has been derived from extensive empirical observation of ‘what works’, it is to be expected that many of the most successful research programmes and institutes already exhibit many of the key features described in the theory<sup>47</sup>. The application of the insights gained from this international research is variously described as the National System of Innovation (NSI)<sup>48</sup> or more broadly as a ‘knowledge systems’ approach. This approach is summarised in the following chapter.

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<sup>47</sup> For instance, the Central Leather Research Institute in India was one of the first in developing countries to form strong partnerships with the users of knowledge – for instance: “CLRI is one of the few research laboratories of the World to have a strong Academy–Research–Industry partnership linkage. Thus the Trinity – the University, R&D Laboratory and the Industry – linkages are not only strong, but it has been working effectively and profitably” . “CLRI ... maintain[s] very close links with the industry – both decentralised and organised sectors. The Institute has taken the industry into confidence and working in tandem in all its phases of development”... <http://www.clri.org/home.asp>.

<sup>48</sup> See Freeman, Christopher, *Technology Policy and Economic Performance: Lessons from Japan*, Frances Pinter, London, 1987; Lundvall, Bengt-Åke, *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, Pinter, London, 1992; Nelson, R R, *National Innovation Systems*, Oxford University Press, New York, 1993.



## 4 The Innovation Systems Approach

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### From 'Research' to 'Innovation'

56. In 2001–2002, the Crop Post-Harvest Programme set out to do something that was both exciting and ambitious. The Programme's management and the Programme Advisory Committee had explicitly chosen to shift from a traditional approach to funding 'research' to one that focuses on the elements of the wider system that are required if the new knowledge generated by research is to have to a positive impact on economic systems – that is, to shift the emphasis from 'research' to 'innovation'. It was ambitious because at that time the Programme had a very few years still to run. This meant that everything had to be done at great speed, with little time for the management team to internalise fully the approach and to bring all the many other players on side.

57. However, because of this ambitious initiative, the Crop Post-Harvest Programme provides a rare opportunity to reflect on this change and to see what lessons can be learned that might usefully guide future research funding and management. The great advantage for the CPH Programme of adopting this approach was that it was based on a huge amount of experience in many countries and sectors that had been extensively summarised and synthesised.

58. This chapter provides a brief summary of the ideas that currently make up what has become known as the Innovation Systems (IS) approach. The extent to which the CPH Programme and its many project managers fully adopted the approach will be considered in subsequent chapters.

59. The starting point for much of the relevant literature was the attempt to explain the differences in the role that science and technology plays in the economic performance of major industrial countries. For some people, this was a simple question about why the UK was successful in producing Nobel Prize winners, but less successful than, say Japan, in harnessing new knowledge to increase international competitiveness. The resulting literature – now labelled the National Systems Of Innovation (NSI) or the innovation systems (IS) approach – essentially provides a guide to 'best practice' on how to innovate successfully, and ultimately how to increase the impact of research.

60. In this context, the British Department for Trade and Industry has remarked:

*the concept of the 'innovation system' ... is loosely defined as the interaction at local, national and international levels of the specific actors involved in innovation (enterprises, universities, the public sector), each of whom has an effect dependent on their individual innovation performance. ... Strong similarities are emerging between innovation systems in different countries*<sup>49</sup>.

61. The essential insight of the IS approach is to switch attention from 'research' to the 'processes of innovation'. Research becomes just one element of a wider process of transforming 'new knowledge' into goods and services. It emphasises the importance of both a large number of key actors and institutions involved with successful innovation, and the links among these actors that enable them to operate as an effective 'system'. This is in

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<sup>49</sup> Science and Innovation Strategy Department of Trade and Industry 2001, Annex E.

sharp contrast to the more ‘linear model’, which characterises much current practice within the development community, where funds are typically allocated to researchers to do ‘research’ and then, often in a separate exercise, the research results are handed to ‘extension agents’, trainers, or ‘communications professionals’ to deliver them to ‘the target audience’.

62. The innovation process is thought to be better captured by biological analogies and reference to ‘evolutionary process’ than by Newtonian physics so favoured by economists and their reference to the movement of billiard balls! The innovation process above all else is a system. This means that the allocation of resources is most likely to result in innovation if it is guided by a ‘diagnosis’ of the strengths and weaknesses of the system as a whole, rather than focusing on one component such as research<sup>50</sup>. The innovation process requires flexibility and adaptation, rather than blueprints and rigid frameworks.

63. The IS approach recognises that communications and extension will remain important parts of the innovation process, but suggests that much current practice is like pushing more knowledge down a hosepipe, in the hope that at least some of it will come out the other end, rather than investing in the quality and effectiveness of the pipe, worrying about where the knowledge needs to emerge and investing in the processes, mechanisms and institutions that will utilise the knowledge once it emerges from the end of the pipe<sup>51</sup>.

64. The message for governments that support research and wish to increase the impact of their expenditures – that is, to generate innovation – is that they should concentrate as much on the *users* of knowledge as they currently do on the *suppliers* of new knowledge.

### *What is Innovation?*

65. Much can be said about the nature and meaning of ‘innovation’, but in this context it means the *use* of new ideas, new technologies or new ways of doing things in a place or by people where they have not been used before. The distinction between ‘invention’ (creation of new knowledge) and ‘innovation’ (in the sense of first commercial use) is crucial. Experience over many years shows that “working with and re-working the stock of knowledge is the dominant activity in innovation”<sup>52</sup>. Indeed the essence of innovation in most circumstances can be described as ‘creative imitation’.

66. Similarly, the term ‘research’ is itself open to a wide interpretation, but in so far as it is a generator of new knowledge, the IS approach makes an important distinction between two types of knowledge: ‘tacit knowledge’ and ‘codified knowledge’. The former is

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<sup>50</sup> One member of the Programme Advisory Committee said that he saw systems of innovation as being very similar in concept to the Hazard Analysis Critical Control Point (HACCP) approach to identifying and controlling the potential risk that was developed for the US space programme but is now extensively used in food safety systems: Dr G R Wint, personal communication, November 2005.

<sup>51</sup> The analogy of the hosepipe may be unacceptable to some readers who believe it implies a linear model. A more appropriate analogy has been suggested by Erik Arnold: “we probably have to abandon the old images of armies led by generals via strategic plans and the attainment of objectives. We should even give up the newer, more decentralised analogies with team sports such as football and the tutelage of efficient coaches. We need a much messier image, with decentralised action, bounded rationality, and limits on the opportunities for optimisation and effective control. Perhaps we should think of a flock of sheep, with its attendant sheepdogs and shepherds, zig-zagging its way a little erratically up the mountain towards the summer pastures?”: see Arnold, Erik. Evaluating research and innovation policy: a systems world needs systems evaluations, *Research Evaluation*, Beech Tree Publishing, Guildford, UK, ISSN (print) 0958-2029 E-ISSN (electronic) 1471-5449, forthcoming.

<sup>52</sup> Arnold, Erik and Martin Bell, Some new ideas about research for development, in Danish Ministry of Foreign Affairs, *Partnership at the Leading Edge: a Danish Vision for Knowledge, Research and Development*, April 2001, p. 288. Download from [http://www.um.dk/NR/rdonlyres/7CD8C2BC-9E5B-4920-929C-D7AA978FEEB7/0/CMI\\_New\\_Ideas\\_R\\_for\\_D.pdf](http://www.um.dk/NR/rdonlyres/7CD8C2BC-9E5B-4920-929C-D7AA978FEEB7/0/CMI_New_Ideas_R_for_D.pdf).

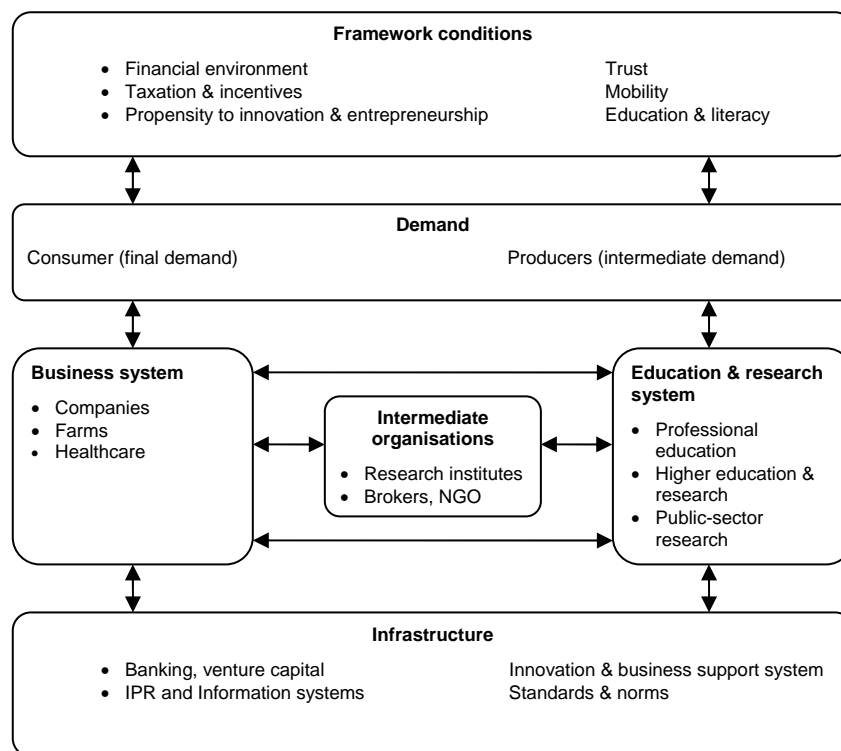
associated with human skills and experience, while the latter is documented, or in some other way systematised (for instance, in blueprints, manuals, instructional videos or computer programmes). Innovation usually requires both types of knowledge: for instance, it would not be possible to build a jet engine solely using blueprints and other codified knowledge. Similarly, farmers have been shown to contribute importantly to the innovation process with their tacit knowledge of local circumstances and years of farming experience.

### *Technology and Knowledge*

67. Improvements in technology provide the means for producing more (or better) goods and services with less resources and effort. It is now widely accepted that the mastery of technology and the processes of innovation are major sources of international competitive advantage. Furthermore, mainstream organisations such as the OECD now go as far as to argue that the capacity to manage these processes of technical change to advantage increasingly defines the huge divide between industrialised and developing countries<sup>53</sup>.

### *National Systems of Innovation*

68. The ideas associated with National Systems Of Innovation as they relate to developing countries are perhaps most effectively summarised by Arnold and Bell<sup>54</sup>. They provide a highly simplified diagram of the major elements of a successful innovation system.



69. The diagram is used to emphasise:

<sup>53</sup> It has been recognised for many years that the capacity to manage technical change to their advantage increasingly defines the divide between industrialised and developing countries. OECD, *Managing Technological Change in Less-Advanced Developing Countries*, document reference 43 91 03 1, OECD, Paris, 1991, pp. 7, 12 and 13. The World Bank's 1998 *World Development Report* starts from the premise that "poor countries – and poor people – differ from rich ones not only because they have less capital but because they have less knowledge" (page 1). See also OECD, *Technology and the Economy: the Key Relationships*, ISBN 92-64-13622-3, 1992.

<sup>54</sup> See footnote 52.

- the importance of **both** the ‘*supply-push*’ of the research community and the ‘*demand-pull*’ of the users of new knowledge. Indeed the successful system requires a constant interaction between the organisations and actors of the left of the diagram – which for simplicity can be called the ‘users’ of knowledge – and those on the right – predominantly the ‘suppliers’ of codified knowledge.
- the importance to successful innovation of *networks* that provide effective communication channels linking the various organisations and individuals that make up the system. Such networks can be both formal and informal, but informal links appear to be particularly important, especially where they foster trust between the various parties, and thereby lower the transaction costs of the interactions. Trust relations result in both parties knowing each other’s needs and the nature and quality of the goods and services on offer, and may even obviate the need for legal contracts and reduce the risk of non-payment. This need for successful innovation systems to establish low transaction cost trust relationships has been observed to lead to the ‘clustering’ of actors in the same location for certain types of innovation (such as Silicon Valley in California, the Cambridge Science Park, or even the surgical instrument cluster in Sialkot, Pakistan<sup>55</sup>).
- the importance of *intermediate organisations* in finding out what producers (and their customers) want and searching through the range of options within the stocks of existing and new knowledge to find what best meets the need. These tasks of intermediation can, in principle, be carried out by any of the organisations listed on the diagram, but they tend to be undertaken by consulting or design organisations, brokers (sometimes known as ‘technological midwives’), and even NGOs or applied research institutes and research associations (when operating in consulting or facilitating mode). Arnold and Bell suggest that they “typically have low status compared with universities and basic science institutes” (page 296). Increasingly, small and micro enterprise support organisations (those that supply ‘business development services’) are performing this role in successful economies, often with an element of government subsidy.
- the ‘*framework conditions*’ and the basic infrastructure of the system (shown at the top and bottom of the diagram). These have also been seen to be crucial elements of the system. Indeed, it is often the ways of working, aspects of culture, the social value placed on innovation and entrepreneurship, banking ‘ethos’, that most effectively explain the difference between countries that innovate and those that do not. Weaknesses in the infrastructure often form the major constraint to the effectiveness of much research in developing countries. In fact, in a number of countries, these capacities are actually deteriorating, further reducing the likelihood that research alone will result in poverty-reducing innovation.

70. It is important to log here some important factors that the simple diagram above neglects in achieving its simplicity. One is the absence of the international dimension: the National Systems of Innovation in any particular country operate in a world in which there are many other actors on the global stage and the stock of knowledge and expertise outside

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<sup>55</sup> See Schmitz, Hubert, Editor (with Khalid Nadvi), *Industrial Clusters in Developing Countries*, special issue of *World Development*, 1999.

a national economy is both an asset to be drawn upon and a threat. As we shall see, this is particularly important for developing countries.

71. The second simplifying omission is that of time: certain activities in the innovation process, for instance, ‘the creation of new knowledge’ (including agenda setting), may need to be given greater emphasis at some time periods than at others in the process of innovation.

72. The National Systems of Innovation literature provides a great deal of insight into the way ‘learning’ takes place, how decisions about innovation are made, and the capabilities required to innovate. These include:

- *Bounded rationality.* Although much of economic theory assumes optimal and rational behaviour, NSI accepts that in practice decisions makers do not (cannot) know everything and do not interpret perfectly all they do know. It has been recognised for a long time that “the whole life of policy is a chaos of purposes and accidents, it is not at all a matter of the rational implementation of the so-called decisions through selected strategies”<sup>56</sup>.
- *Path dependence.* “What a company or institution can do today depends on what it could do yesterday, and what it has learnt in the meantime”<sup>57</sup>. This is particularly important for developing countries or those companies wishing to break into a new area of activity. If the company does not have the necessary tacit knowledge it must invest to acquire it, or hire people who bring it with them.
- *Organisational learning.* Bounded rationality and path dependence mean that innovators must continuously learn. They continuously test the environment within which they operate by adopting an iterative process in which they embark on a course of action and modify it in the light of experience. This learning, though, is not a passive process, but one that requires purposive action and investment in the necessary time and resources.
- *Institutional learning.* A distinction is made between organisations and institutions: in this context, institutions refer to the “the mechanisms, rules and customs by which people and organisations interact with each other (i.e. the ‘rules of the game’)”<sup>58</sup>. The concept of institutional learning refers to finding ways to do things in new ways. It may be the result of analysis and conscious efforts to change the rules of the game (including rules and regulations), but can also include the behavioural changes that occur spontaneously as people try to solve problems and learn from their experience.
- *Technological capacity.* Organisations can build up these capacities through learning, experience, training, recruiting skilled staff and investing in new equipment or systems. “Crudely, the ability of companies to learn depends on their internal capabilities, and that these capabilities can often be represented by the number and level of scientifically and technologically qualified staff in an organisation”<sup>59</sup>.

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<sup>56</sup> Clay, Edward and Bernard Schaffer, *Room for Manoeuvre: an Exploration of Public Policy in Agricultural and Rural Development*, Institute of Development Studies, 1984.

<sup>57</sup> See Rosenberg, Nathan, *Perspectives on Technology*, Cambridge University Press, Cambridge, 1976.

<sup>58</sup> See DFID’s Sustainable Livelihoods Guidance Sheets: [http://www.livelihoods.org/info/info\\_guidancesheets.html](http://www.livelihoods.org/info/info_guidancesheets.html).

<sup>59</sup> See Arnold and Bell (footnote 52), p. 293.

- *Absorptive capacity*. “Information only becomes knowledge if the receiver perceives it to be so ... [T]echnology transfer ... only works well where the recipient carries out its own related R and D programme”<sup>60</sup>.

#### *What is new?*

73. Many people confronting the National Systems of Innovation literature for the first time recognise some of its elements from their own discourse. These include:

- Participation (understanding user needs);
- Partnership (changing power relations, reducing dominance of ‘researchers’, and increasing the ‘voice’ of the users, clients etc);
- Capacity building;
- Trust relations and the reduction of transaction costs;
- Informal networks and social capital.

74. This is hardly surprising as many elements of current best practice in development thinking address some of the same issues as best practice in innovation thinking. Yet it is perhaps a measure of the dominance of the research community that these ideas have not yet been applied to their own research work, probably because of a fear of loss of status, and the shift of power from the suppliers of knowledge to the users of knowledge, and the resultant change in the type of research that is needed for effective innovation.

75. The recent RNRRS ‘synthesis study’ on innovation attempts to address this question, examining the extent to which elements of the innovation approach can be found in other RNRRS Programmes<sup>61</sup>. This showed that many of the elements that make up the ‘Innovation Systems approach’ have been increasingly incorporated within the different RNRRS Programmes as the emphasis on ‘poverty impact’ has strengthened in recent years. These include elements of innovation system capacity development, two-way communications, participatory and action research. However, this report suggests that the development of these elements has been unsystematic and that the IS framework provides valuable additional insights as to why innovation does and does not occur, and indicates those actions that managers of research programmes can take that are most likely to be effective in bringing new ideas and technologies into use.

#### *The IS Perspective and Developing Countries*

76. It may be argued that, since the IS approach is derived from the experience of technologically advanced industrial countries, it is not applicable to the very different conditions in developing countries. This is an empirical matter, but a number of insights about improving the effectiveness of both research and development can be obtained from applying the IS approach to developing countries.

77. Certainly there are big differences between the innovation systems of developed and developing countries. One of the main ones is that the ‘demand’ side of the system is particularly weak in developing countries – even though much of the policy intervention focuses on the more obvious weaknesses in the ‘supply’ system. In industrialised

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<sup>60</sup> Clark, Norman, Innovation systems, technology assessment and the new knowledge market: implication for third world development, *Journal of the Economics of Innovation and New Technology*, 11(4–5), 2002, pp. 353–368.

<sup>61</sup> Rath, Amitav and Andrew Barnett, Innovations Systems: Concepts, Approaches and Lessons from RNRRS, RNRRS Synthesis Study No 10, The Policy Practice Limited, discussion draft, 23 November 2005.



countries, most research is carried out by and within private companies<sup>62</sup>. This means that productive enterprises can articulate what they need from the rest of the innovation system. In developing countries, almost all research is funded by the state in public institutions. In such circumstances, the ‘demand’ placed on research organisations by actual or potential users of knowledge is often weak. Furthermore, whatever demand there is, often ‘leaks’ abroad to industrialised countries. Unlike in industrialised countries, it is often difficult to involve ‘the demand side’ in the governance of research organisations working in or on developing countries. More generally, the productive sector, and poor producers in particular, have great difficulty in specifying their needs for new knowledge (and, indeed, in paying for it). In developing countries, mechanisms have to be found that can translate the ‘needs’ of poor people into ‘effective demand’.

78. Despite these differences, all research inevitably takes place within an innovation system whether or not it is described as such – the main difference is that in some countries these systems work well and in others they do not! It is precisely these differences that provide the insights from which researchers and innovative organisations can learn. The key insight is that, if research is to have an impact, it needs to be carried out in close proximity to the users of the resulting knowledge, their clients and customers.

79. The innovation systems literature also gives a serious warning to both the naïve and the faint-hearted. It tells us that innovation of any kind is going to be difficult in the weaker developing countries with their poor, and often deteriorating, ‘framework conditions’ and lack of infrastructure<sup>63</sup>. It is unlikely that individual programmes, let alone projects, can buck international trends that are operating against poor people in renewable natural resource systems.

### *Does it Work for Agriculture?*

80. Given its origins in northern industrialised countries, the question inevitably arises as to the relevance of the IS approach to other sectors in developing countries, particularly in agriculture. In the agricultural sector, research is often location-specific and often involves the adaptation of generic knowledge to local conditions. Furthermore, the mechanisms by which potential users (particularly smaller farmers, small and micro-enterprises, small traders etc) gain access to new knowledge are weak.

81. Furthermore, individual developing countries are – and need to be – close to the science/technology frontier in fields such as agriculture and health care, where problems are likely to be specific to a country or a region. In these cases, there may be fewer opportunities for ‘creative imitation’, and there are good reasons for donors to fund scientific research, in addition to supporting the application of knowledge.

82. In part, it is the purpose of this report to see whether the IS approach can be applied usefully to the CPH system. Yet it is precisely because of these weaknesses in the framework conditions facing developing countries that it is believed that there are strong *a priori* reasons to suggest that the IS approach is likely to be of relevance to agriculture, as it highlights the importance of researchers working in close partnership with farmers, strengthening the mechanism by which ‘user needs’ can be articulated and understood, and

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<sup>62</sup> For instance, the major life science companies invested some \$2.6 billion in agricultural R and D in 1998: Accessing modern science: policy and institutional options for agricultural biotechnology in developing countries, *World Development*, 30(6), p. 932.

<sup>63</sup>. See reference in footnote 53.

active collaboration with those organisations that make and sell (or in other ways make available) the goods and services that embody the results of new knowledge.

83. At the empirical level, the CPH Programme has explicitly examined this question. In particular, the Programme in India led the way with project R7502, which looked at “Optimising institutional arrangements for demand driven Post-Harvest research, delivery, uptake and impact on the livelihoods of the poor through public and private sector partnerships”. This was started in 1999 and resulted in the important book *Post-Harvest Innovations in Innovation: reflections on partnership and learning*, edited by A J Hall, B Yoganand, R V Sulaiman, and N G Clark<sup>64</sup>).

84. There is similarly a growing body of evidence from other sources. The CGIAR’s own work in this area is conducted in part through the Institutional Learning and Change Initiative (ILAC) that is hosted by the International Plant Genetic Resource Institute (IPGRI) in Italy<sup>65</sup>.

#### *What about Policy Research?*

85. It might also be argued that ‘policy research’ similarly deals with unique local problems, and opportunities for creative imitation may be similarly limited. Here again, though, the IS approach provides a number of guidelines for the way such activities are likely to result in behavioural change and other forms of innovation. This issue is the subject of a number of ongoing studies<sup>66</sup>. Many of the conclusions from that work find echoes in the conclusions and insights provided by the IS approach. For instance, the importance of forming alliances or temporary coalitions, the need to work in close collaboration with the users of the policy analysis and to fashion the outputs so that they are timely, are from sources that the audience regards as credible, and are in a narrative form that is adapted to the needs of the user.

86. The extreme case is clearly where researchers are trying to set a new intellectual agenda – that is, that, by definition, they are ‘ahead’ of what the users say they want to know. This may be resolved by a clearer understanding of what the Innovation Systems approach is saying. Certainly there are likely to be moments in the innovation process when ‘science push’ is critically important, but, if the resulting agenda is to influence policy, then interaction with, and understanding of, the needs of other parts of the system are likely to be vital. Equally, as will be shown in subsequent chapters, there are a number of cases where the inclusion of regulatory and other government agencies in the ‘coalitions’ had a significant effect on the degree and speed of the ‘ownership’ of policy change resulting from research.

87. More generally, DFID staff have asked whether a typology could be constructed of knowledge-generating activities for which the Innovation Systems approach seems more applicable than others<sup>67</sup>. Certainly it might be expected that the IS approach is most

<sup>64</sup> <http://www.cphpsouthasia.com/cphp.asp>.

<sup>65</sup> ILAC describes itself as “a grass roots inter-center initiative hosted by IPGRI”. Its web site states that it is being supported by funding from the Rockefeller Foundation, the Netherlands Ministry of Foreign Affairs (DGIS), Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) and the International Fund for Agricultural Development (IFAD). Contact: Jamie Watts Project Leader IPGRI, E-mail: [j.watts@cgiar.org](mailto:j.watts@cgiar.org).

<sup>66</sup> In particular, in the DFID-funded RAPID programme at ODI: see: <http://www.odi.org.uk/RAPID/index.html> Also see: Duncan, Alex, How can research based development interventions be more effective in influencing policy, November 2005, paper prepared under the Making Markets Systems Work Better for the Poor (M4P), Hanoi, 2005. See: <http://www.thepolicypractice.com/projects.htm>.

<sup>67</sup> Paul Spray, personal communication, 7 February 2005.



applicable to new knowledge that is embodied in a new machine. A great many research programmes in developing countries find it difficult or impossible to progress past the prototype stage. Yet, even in the case of knowledge about new ways of doing things, such as improved processes for storing crops or ways of improving hygiene in informally vended food, the Innovation Systems approach provides considerable insight into how such innovations can be effectively introduced. This is discussed further at paragraph 330).

#### *Is the IS Approach Applicable only at the Level of National Systems?*

88. A more fundamental question is whether the IS approach provides useful insights at the sub-national, sectoral or even project level, given that the approach was initially focused on National Systems of Innovation. Certainly many researchers have found that impacts at the project level are often overwhelmed by weaknesses in a country's infrastructure and framework conditions. However, there is a growing sense that the innovation approach has its greatest policy relevance at the sectoral or product level, precisely because the problems are often so sector specific. One of the more surprising conclusions of this review is just how effective the IS approach was, even at the project level and even in very hostile environments. It may well be that, as this environment deteriorates, projects have to do much more themselves if change is to be successful.

89. Nevertheless, even in industrialised countries, government action can only operate on part of the innovation system at any one time, but the key issue is that all interventions (however small) take place in the context of a clear understanding of the innovation system and how it can be strengthened.

90. Whether the IS approach provides useful insights at the Programme level is again an empirical question.

#### *Implications – for Developing Countries*

91. The main implication for developing countries (and indeed the donors that assist them) is the shift of focus from 'research' to 'innovation'. This, in turn, requires investing in those people, organisations and institutions that make up the systems necessary for effective innovation, rather than for 'research' *per se*. There are well-rehearsed arguments justifying state investment in 'public-good' research on the grounds that the private sector will always invest at levels that are socially sub-optimal<sup>68</sup>. There are even stronger arguments suggesting that there is a legitimate role for the state to help the NSI to work effectively<sup>69</sup>. In most countries, this will require investments that go beyond science<sup>70</sup>, universities and the state sector. It is likely to require a diagnostic mapping of the various 'innovation systems' to establish where the main weaknesses and bottlenecks are located so as to guide the most appropriate investment in the:

- Mechanisms necessary to increase the demand side of the innovation equation and find ways the users of new knowledge can develop the ability to pay for it.

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<sup>68</sup> This is discussed at length in Surr, Martin (team leader), Andrew Barnett, Alex Duncan, Melanie Speight, with David Bradley, Alan Rew and John Toye, Research For Poverty Reduction, DFID Research Policy Paper, paragraph 240. See: [http://www.DFID.gov.uk/Pubs/files/pov\\_red\\_pol\\_paper.pdf](http://www.DFID.gov.uk/Pubs/files/pov_red_pol_paper.pdf).

<sup>69</sup> Arnold, Erik, Research evaluation: evaluating research and innovation policy: a systems world needs systems evaluations, a paper originally given at the EVA conference of Nordic evaluators at Håholmen, Norway in September 2001, forthcoming. Erik Arnold works for Technopolis Ltd, 3 Pavilion Buildings, Brighton BN1 1EE, UK; +44 1273 204320; erik.arnold@technopolis-group.com and [www.technopolis-group.com](http://www.technopolis-group.com).

<sup>70</sup> Although it is important to note that experience in OECD countries suggests that investment in science is particularly important for producing the skilled people necessary for certain types of innovation.

As a first step, this will probably involve the users of new knowledge more effectively in the governance of R and D expenditure.

- Capacities in firms and on farms to absorb and utilise new knowledge to improve productivity, and the range and quality of goods and services. OECD countries found it particularly effective to encourage the efforts of firms themselves and to stimulate groups of firms to work together.

### *The Remaining Questions*

92. This then summarises the IS approach. An immediate question arises as to whether the phrase ‘Partnerships for Innovation’ used by the CPH Programme to describe its new approach is essentially the same as the IS approach. This will be explored in the subsequent chapters, but it is clear that the language of the new Programme documentation and practice does make reference to the key ideas of involving key stakeholders, institutional learning and partnerships. What is less clear, and the subject of subsequent chapters, is just how well these ideas were understood by both the Programme managers and the project participants, and whether the relative success and failure of past projects of the CPH Programme can be explained in terms of the IS approach, whether or not the participants used this particular language. This again will be explored in the following chapters.

## 5 National Innovation Systems in Practice

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93. While it was not the purpose of the study to examine the research and innovation systems in the countries visited, it is important to set the CPH Programme in a wider context, even if superficially. In this chapter, the situation in four countries is considered: India, Ghana, Uganda and Tanzania<sup>71</sup>. The huge variation between these countries raised a number of interesting issues, and suggests an important conclusion, namely, that whatever strategy DFID might adopt in the future it will need to be sufficiently flexible to deal with the very different circumstances and institutional arrangements in each country.

94. Generally, it seems as if the environment for doing research in Africa was deteriorating. Many of the earlier investments in universities, research institutions and extension services have been undermined over many years. Even the effectiveness of the traditional national agricultural research system model is breaking down with the continued underfunding of extension agents that were expected to transfer new knowledge to farmers. In some cases, NGOs are taking on the role of extension agents, or providing funding to extension agents to visit particular areas, but their coverage is often limited and piecemeal, and it is difficult to believe that such interventions can be anything more than a short-term palliative. It seems likely that there would be less interest in the innovation approach if there were an extremely effective extension service that was highly interactive.

95. A recent survey of agricultural scientific and technological capacities in Africa for the NEPAD provides a useful summary of some of the rapid and complex changes that are facing Africa's agricultural innovation systems<sup>72</sup>:

*First, scientific advances, related technological innovations, and accompanying institutional changes are changing the focus and conduct of agricultural research in very profound ways [eg biotechnology].*

*Second, the private sector is becoming a major investor in agricultural R&D [in part because of globalisation, and] the opening up and integration of national economic systems as well as liberalization of trade, which is changing the locus of agricultural research. [Policy makers need to] “ensure that commercial interests and goals do not overshadow the need to address public needs” [as they face increasing] “pressure to identify strategic ways of partnering with private industry without losing sight of their responsibility to address problems of the poor and generate public goods.” However, there are also pressures towards privatisation within developing countries simply due to national macroeconomic reform and new entrepreneurial opportunities that have begun to present themselves.*

*Third, public agricultural research organizations are faced with fundamental questions about their relevance, performance and accountability. There is increasing evidence and consensus that current configurations of public*

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<sup>71</sup> Although Kenya, Zambia and Zimbabwe were also visited briefly, there was no time to interview the main actors in the agricultural systems of these countries.

<sup>72</sup> Clark, Norman, Science policy and agricultural research in Africa: a capacity building needs assessment, NEPAD's Office of Science and Technology and the African Ministerial Council for Science and Technology, January 2005. Text in italics are direct quotes. However, to shorten the quotation, some descriptions have been deleted and summarised in much shorter statements placed in square brackets.

*agricultural research are not responsive to growing demand for new knowledge and innovations, and that they are not changing fast enough to respond to technological and geo-economic developments.*

96. This difficult situation is compounded for DFID-financed researchers by the withdrawal by DFID from the uptake and capacity-building components of the innovation systems in many of these countries (as was noted by the RNRRS Evaluation quoted in paragraph 26 above.).

97. If poverty-reducing innovation is the main objective, all this points to the importance of allocating resources according to a view of the strengths and weaknesses of the whole system (see paragraph 62). As will become clear from the examination of the situation in individual countries, the 'research project' mode of intervention is unlikely to be the most appropriate instrument to bring science and technology to bear more effectively on poverty reduction. In India in particular, lack of research-project funding did not appear to be the binding constraint. The problem appeared to be more about finding ways of unleashing the huge scientific and technological capabilities that already exist, but that appear to be currently constrained by bureaucratic rules and unproductive incentives.

## Ghana

98. In relation to the countries visited, Ghana appeared to be facing the most difficult situation. Many interviewees noted the poor (and probably) deteriorating environment in which CPH research (and probably most other research) is going on in Ghana. Even so, there are signs of investment in the research system, with the Food Research Institute's new building now under construction.

99. A great deal is already known about the shortcomings of the system and a number of consultancies have been undertaken to advise on possible reforms (including one by NR International itself, although its report is not in the public domain).

100. The web site of Ghana's Council for Scientific and Industrial Research (CSIR) suggests that two organisations have crop post-harvest responsibilities: the Crop Research Institute (CRI) and the Food Research Institute (FRI). The CRI's mission statement includes "post-harvest – varieties with post-harvest attributes. Management of harvesting, drying, storage, processing and utilisation; Socio-economics" (<http://www.csir.org.gh/cri.html>). FRI's mission includes the similar aim "To provide appropriate technology packages for processing and storage of raw agricultural produce to facilitate curtailment of post-harvest losses and promote value addition for local and export markets" (<http://www.csir.org.gh/fri.html>).

101. The Ministry of Food and Agriculture (MOFA) works to an Accelerated Agricultural Growth and Development Strategy designed to increase the sector's annual growth rate based on the long-term strategic Programme for Ghana 'Vision 2020'. This strategy is assisted by The Agriculture Services Sector Investment Programme (AgSSIP), which is intended to empower grassroots organisations to negotiate better with actors responsible for the delivery of services. It also aims to strengthen producer organisations, such as co-operatives and farmer groups, to provide better services to their members to facilitate technology adoption, by improving access to inputs and facilitating marketing.

102. It was openly accepted by all parties that effective research could not be carried on at the universities or CSIR institutes without additional resources either from international

donors or the local private sector<sup>73</sup>. Between 1999 and 2002, aid income for the Food Research Institute was equal to 51.7% of the amount provided by the Government of Ghana (“the Subvention”)<sup>74</sup>.

103. Interviewees suggested that the government wants organisations such as FRI to move from research to commercialisation, but it was argued that “this is not really FRI’s core competence ... Scientists should do research and others should do the commercialisation”. As in many poorly performing innovation systems, it was also argued that private companies do not really have the competence to make demands on organisations such as FRI. In the three years to 2002, only 3% of FRI total income came from local private-sector commercial contracts.

104. At the time of the interviews in October 2003, the FRI had five projects from the Ministry of Food and Agriculture’s AgSSIP. Some are competitively tendered and others are described as “normal research” where they select topics from a list. When bidding for research contracts, the FRI forms partnerships with others, submits concept documents and then full proposals. It was suggested that FRI probably had too narrow a skill base in the past, but now includes marketing and socio-economists. The FRI had 37 professional staff, 90% of which have PhDs. The total staff is said to be 180. The capacity was described as improving, in part because of a grant from the Netherlands. Externally funded projects have enabled them to get training, to buy vehicles and other equipment.

105. Universities also undertake crop post-harvest activities, but tend not to compete with the research institutes, which undertake more applied research.

106. It was suggested by some interviewees that the impact of past research had been limited because of weaknesses in extension. It also meant that they often “did the same research again”.

107. The situation in Ghana brings into high relief the strategic questions facing donors, in particular, whether, in such circumstances, it is most appropriate to be supporting ‘research’ projects, or more generally seeking to leverage reform and ‘build capacity’. Particularly contentious were the policies towards, and levels of, ‘topping up fees’. The way external support is provided becomes critical both to keeping staff in the country and in research, but also for determining the direction and priorities for future research.

108. The dire state of funding for Ghanaian organisations meant the resentment felt by Ghanaians was particularly acute about the large amount of donor finance (by DFID and others) that had been spent in the past on nationals of developed countries. A number of people speculated that the cost of keeping one of the CPH Programme’s expatriate researchers in Ghana was probably larger than the whole government budget of the Food Research Institute. On the other hand, some people doubted that donors would be willing to provide any funds to Ghana unless nationals from the donor country were heavily involved.

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<sup>73</sup> FRI staff rates are said to be £70 per month (1 million cedis) but at least some staff also receive income in kind in the form of housing, free health care and assistance in maintaining their private cars. It was suggested that a senior staff member might get about 2.2 million cedis a month plus housing etc. NRI currently apparently buy the time of FRI staff at the rate of \$150 to \$250 per day. These rates are set by CSIR, but it was not stated how much of this fee is given to the staff. However, rates were much lower in earlier projects where NRI merely bought in the services of FRI staff.

<sup>74</sup> In 2002, the government subvention was 2,600 million cedis, and aid was approximately 1,000m cedis. That is, aid was 38% of the subvention or 28% of the income from the government and from aid. Data supplied in graphs by FRI.

109. DFID appeared to be one of the major sources of donor finance for crop post-harvest research, although there had previously been programmes funded by the German aid programme, the International Institute of Tropical Agriculture (IITA) in Nigeria, and there was news that there was soon to be a new EU-funded project (with NRI).

110. However, there was a strong impression that the large proportion of CPH Programme's funds allocated to Ghanaian problems benefited from NRI's long-term association with Ghana (going back into the early 1990s if not before) and Ghana's relative stability and hospitality to foreign researchers<sup>75</sup>. Only five out of 50 of the CPH Programme's projects did not involve NRI. A personal communication from an NRI scientist described the situation as follows: "By and large CPHP projects were viewed as NRI projects – as indeed they had been prior to the RNRRS. This had persistent implications for a sense of ownership of the projects. Quite often the main role of the Ghanaian scientists was to gather data (or samples) for analysis by NRI scientists in the UK. A number of Ghanaian collaborators described their role as that of technicians. Ghanaian scientists often received overseas training as part of their collaboration in the CPH Programme. In at least one case the UK project leader was also the Ghanaian PhD supervisor"<sup>76</sup>. However, the first project to be designed and led by a Ghanaian scientist started in 1999 (Project R7581 led by Dr Plahar, Director of the Food Research Institute).

111. Contact between the CPH Programme and the staff in DFID's local office was said to be highly variable and appeared to depend on the personality of the people involved. Interviews at DFID's office suggested that the current staff felt that communication between central research and country offices could be improved and there was often no 'ownership' of research by the DFID office.

112. The work of DFID Ghana was said to have changed radically with the shift to Multi-Donor Budget Support (MDBS). Some nine donors, representing one third of Ghana's official development assistance, now come under this initiative. Some five percent of this budget goes into an untied technical assistance fund from which Ghanaians can hire such assistance as they need from anywhere in the world.

113. The DFID office certainly believed that certain policy areas could be "unblocked" by more research. They believed in particular that there needed to be more "political analysis" to understand why progress is so limited. When DFID Ghana commissioned such research it was called "consultancy", and was probably not put into the public domain. They were now developing an in-country Advisors' Research Committee and it was likely that it would focus on topics driven by the Country Assistance Programme (CAP).

114. A key element of DFID's multi-donor budget support was the idea that civil society was the key to monitoring. In order to enable civil society to understand what was going on, DFID had taken the lead in creating a Ghana Research and Advocacy Programme (G-RAP) to provide long-term core funding to a number of independent research institutes. At the moment, the independence of Ghanaian institutes was said to be undermined by the dominance in their budgets of particular donors (particular "Donor's Darlings"). By

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<sup>75</sup> It needs to be stressed that this was not a decision of NRI but rather of Programme Management to have Ghana as a focus country. The Country Framework Documents were documents of the Crop Post-Harvest Programme, managed by NR International and agreed by the independent Programme Advisory Committee. The projects in Ghana were won competitively and selected by the independent Programme Advisory Committee (A Westby, personal communication, 3 January 2006).

<sup>76</sup> The Crop Post-harvest Programme in Ghana, personal communication, (draft) no date.



working together (DFID, Dutch, Danes and USAID) and giving core, rather than project, money, they hoped to improve independence and public scrutiny of aid-induced reforms. Apparently this approach was driven by DFID Ghana's Governance programme, based on similar work piloted in Kenya. It would have a 'donors' Committee', which would include two local MPs as observers. There would be strict criteria for membership. Those institutes that do not meet the criteria could get technical assistance for capacity building. The consortium would contract out the administration of the Programme. It would appear that this was a useful institutional innovation and one that could be considered for scientific and technical research too.

115. The DFID office felt that, even with MDBS, there was an important role for centrally funded research to alert individual countries to "tricks they may be missing" by their country focus. Interestingly, although DFID Ghana was supporting a Fair Trade Initiative relating to the British Co-op buying cocoa by providing a loan guarantee to the local banks, the office was not aware of the CPH Programme's research in Ghana on Ethical Trade.

116. Despite all these problems, as will become clearer in later chapters, some very effective research work is being carried out in Ghana by energetic, dedicated and highly skilled people. Furthermore, Ghanaian researchers seemed to be particularly enthusiastic about the idea of the coalition approach, and being more in control of their research funded by DFID. It seems likely, for instance, that the Food Research Institute will try to continue to work in 'coalitions' with other stakeholders in its future research.

## India

117. The innovation system in India was at the other end of the spectrum. It has an extensive system of agricultural and other research institutes, many having been in existence for decades<sup>77</sup>. The director of one of these institutes appeared to voice the sentiments of many Indian researchers based at these institutes when he said: "I can get all the money I need from the Government ... money is not the constraint. ICAR is not limited by money". The Government of India has apparently now ruled that the Indian Council of Agricultural Research (ICAR) should not accept foreign funds amounting to less than \$200,000, as the transactions costs were too high.

118. Crop post-harvest is dealt with in two parts of the Indian government's research system: on the one hand, there is The Central Food Technology Research Institute (and Regional Research Labs), which is part of the Council for Scientific and Industrial Research System (CSIR) and was described as being output-orientated and links effectively to industry. On the other hand, there is crop post-harvest work undertaken within The Indian Council for Agricultural Research System and, in particular, at the Central Institute for Post-Harvest Engineering (and its large network called the All India Co-ordinated Research Projects<sup>78</sup>) and the Indian Grain Storage Management and

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<sup>77</sup> Typical of the wide range and longevity of the research institutions is the Indian Lac Research Institute. It is part of the ICAR system and has been in operation since 1924! Lac is a hardened resin secreted by the tiny lac insect *Kerria Lac Kerr (Tachardiidae: Homoptera)*. The resulting product has many uses including varnishes, printers' ink, cosmetics, food processing, waxes and polishes (see R8262).

<sup>78</sup> The All India Coordinated Research Projects (AICRPs) on Post-Harvest Technology was started in 1972. The Project is operating at 33 centres (three new centres approved during IX plan) spread all over the country. The Project, while addressing location-specific post-harvest technological problems also conducts multi-location trials of developed technologies for assessment, adoption and refinement. About 130 need-based technologies have been developed under the Project.

Research Institute (IGMRI)<sup>79</sup>. This system was described as being input-orientated and aimed at meeting farmers' needs.

119. The IGMRI's Hyderabad site is in effect a field station as the head office is in Delhi<sup>80</sup>. They implement their work through the 'save grain campaign' (SGS) set up within the Ministry of Food in every state. The staff believed that there was good two-way communication between the IGMRI and SGS: "we solve the problems identified by the farmers and communicated through the SGS". They also are responsible for all the technical work at the commercial scale related to all grain stored by government agencies, including screening the chemicals used. They had designed a number of grain driers and threshers which were then 'given' to manufacturers, who were free to copy and sell them. The institute propagated its ideas by undertaking 'exposure visits' for local farmers and manufacturers. There appeared to be no assistance for business development nor a quality assurance mechanism on the finished products.

120. In the context of giving away machinery designs it has been pointed out by Arnold that:

*The key is whether the economic incentives have been understood. First, if everyone gets the machine design, you get a Nelson-Arrow type market failure: no-one invests in the research results because no-one can get enough of a monopoly to extract a rent. On the other hand, if only one producer gets the drying machine design, she will extract monopoly rents and thereby reduce the benefits farmers get from drying their grain. So giving away designs sounds attractive but is problematic: you might want to give the designs to a duopoly for a limited period, so that there is price competition and so that price reductions over time will enable trickle-down to increasingly marginal farmers (at the start, only rich farmers will be able to buy the machines)*<sup>81</sup>.

121. However, despite the huge investments in research infrastructure, there is a widespread exasperation that it does not have a commensurate impact<sup>82</sup>. This leads to the widespread view that, although ICAR may be adequately funded (say in contrast to Ghana), it is probably "doing the wrong sort of research". Many people interviewed stated that the crisis in the system was "well acknowledged" and expressed an overwhelming desire to reform the system and to liberate the very able people it contains to enable them to innovate rather than 'merely' do research.

122. Interviews with staff at the IGMRI and the National Research Centre for Sorghum laid bare the huge number of administrative arrangements that constrain their work. For

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<sup>79</sup> In order to develop facilities for applied research and apex-level training in the field of food-grain storage and preservation, a Grain Storage Research and Training Centre was established at Hapur in 1958, which was later expanded into Indian Grain Storage Institute (IGSI) with two field stations at Ludhiana and Bapatla (later shifted to Hyderabad) with financial assistance from UNDP in 1968. Three field stations at Jabalpur, Jorhat and Udaipur were subsequently established in 1981. In 1996, the IGSI was renamed as Indian Grain Storage Management and Research Institute (IGMRI). Field stations at Jabalpur and Udaipur have, however, been closed with effect from October 2002. While the Research and Development and Training activities are undertaken by IGMRI, the work of popularising scientific methods of food-grain storage developed by IGMRI among the farming community is implemented through the Save Grain Campaign teams (<http://fcamin.nic.in/storage.htm>).

<sup>80</sup> It was estimated that the total annual operating budget of the Hyderabad site was now probably 80 lakhs. This is equivalent to about £105,000, or the cost of keeping one expatriate in the country.

<sup>81</sup> Erik Arnold, personal communication, 2004.

<sup>82</sup> This view is confirmed by a recent parliamentary audit of India's research institutions. In an article in the *Indian Express* a former principal scientist at the Indian Agricultural Research Institute suggests that Indian institutions and laboratories created to boost science have squandered billions of rupees through poor management and financial ineptitude: see [http://www.indianexpress.com/full\\_story.php?content\\_id=55635#](http://www.indianexpress.com/full_story.php?content_id=55635#).



instance, all financial transactions undertaken by IGMRI had to be approved by an accounting office in Madras (Chennai) via the postal system. Similarly, the National Research Centre for Sorghum suggested that the restrictive nature of the regulations makes it difficult for them to spend the money granted to them by foreign donors and often there is a lot left over. The regulations in relation to using foreign funds were so onerous that the transaction costs meant that it was probably not worth it.

123. Again the question for DFID and other donors is whether they can best help this reform process by more centrally funded research projects or through more locally based ‘governance reform’ programmes.

124. One view was that, through project-related ‘experimental learning’, the system can be induced to reform and evolve. This enables people within the system to learn from what works and to learn from experiment. Certainly the DFID-supported CPH Programme did this and allowed research institutes to work in new and much more flexible ways. Coalition-type grants meant that they could route the funds through local NGOs and thereby circumvent the time-consuming regulations about financial control, decisions could be made quickly and field trips could be arranged more effectively. A number of CPH Programme projects in India took this approach, for instance, R7828, Decentralisation of food grain storage and distribution, the case study of reform within the Central Institute for Post-Harvest Engineering and Technology (CIPHET), and R8266, the management system for linking tribal communities to markets through ‘value addition’ in Orissa. It was suggested that there were many self-help groups (presumably NGOs) that could be a powerful force for this type of change if they worked together.

125. A contrary, or parallel view, was that reform should be approached more directly through more direct analysis and lobbying to change the rules and procedures that govern research. Such a strategy is similar to DFID’s governance programmes’ “drivers of change” approach<sup>83</sup>. The CPH Programme’s South Asia Regional Office has started along this route by setting up the Innovation Policy Working Group (RIPWIG). The Group initially comprised “members in policy making and donor agencies (Planning Commission and Department of Science and Technology), R&D policy making in Research Councils (CSIR and ICAR), leading NGOs (Development Alternatives – DA, Centre for Technology & Development – CTD), rural technology and employment divisions in the Government (Ministry of Agriculture, Council for Advancement of People’s Action and Rural Technology – CAPART, etc)”. This activity offers the opportunity to influence important policy makers at the Centre. It is funded by a number of interconnected projects funded by the CPH Programme, other parts of DFID and the World Bank<sup>84</sup>.

126. Other interviewees noted that there was generally a lack of demand for change from within the agricultural research system or from the government more generally. Other donors had tried to encourage reform. The World Bank was said to have tried to reform the forestry research system, but found it “very hard”.

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<sup>83</sup> This is described at [http://www.grc-exchange.org/g\\_themes/politicalsystems\\_drivers.html](http://www.grc-exchange.org/g_themes/politicalsystems_drivers.html).

<sup>84</sup> The project was described in Raina, Rajeswari, Institutions for Poverty Reduction, the CPHP PMF: 04-17. In addition, the UNU-Intech web site states that “The first meeting of the Rural Innovation Policy Working Group, jointly convened by UNU-INTECH and the Centre for Research on Innovation and Science Policy (CRISP) took place in September 2004 in New Delhi, India ... The Working Group, which will meet four times a year, aims to link research more closely to policy processes. The initiative is an integral part of a UNU-INTECH research project co-ordinated by Dr Andy Hall, which is investigating innovation processes in civil society initiatives, and drawing lessons for policy-making.”

127. More generally, the National Agricultural Technology Project (NATP) is an instrument for introducing major changes in the Agricultural Research and Extension systems of the country. The project was initiated by the Ministry of Agriculture, Government of India, originally from a massive grant from the Japanese Government, which was handed over to the World Bank to administer. It was to be implemented in 28 districts covering seven states, *viz.* Andhra Pradesh, Bihar, Jharkhand, Himachal Pradesh, Maharashtra, Orissa and Punjab over a period of five years (1998–2003).

128. Essentially the money represents a major incentive for the ICAR to reform. It is beyond the scope of this paper to investigate how effective it has been, but the reference to the recent parliamentary audit suggests that progress has been slow<sup>85</sup>.

129. However, it is important to note that, in the current negotiations with the World Bank about the next round of funding for the NATP, the new programme is to be refocused and renamed as the National Agricultural Innovation Project (NAIP)<sup>86</sup>. The shift in focus and the addition of the term innovation in its title is said to be due in large part to the initiative of the new director Dr Mruthyunjaya who joined as National Director on 24 March 2005. He was previously the Director of the National Centre for Agricultural Economics and Policy Research (NCAP), which has been one of the major sources of thinking in India on the application of innovation systems ideas in agriculture associated with the work of Dr Rasheed Sulaiman who has been significantly funded by the CPH Programme. While great care must be taken in attributing causation, the CPH Programme in India may legitimately claim some part in the reorientation of this driver for change in the Indian agricultural research system.

130. At the time of the review visit in November 2003, DFID's new Country Assistance Programme (CAP) was just about to be published and it was suggested that the text would include something about research. It was thought that the CAP will argue that poverty reduction will depend on agriculture and rural growth, and a "basket of strategies" will be provided both in Andhra Pradesh and Orissa, focusing largely on budgetary support and sector reform. In so far as DFID will attempt to aid reform of the agricultural research system, it is likely to be through programmes such as the Andhra Pradesh Rural Livelihoods Project (APRLP)<sup>87</sup>. It was stated that DFID's concern to assist the reform of the extension system was currently on the 'back burner'. It seems that, as there was so much political change, there was no point in trying for reform until things settled down.

131. Yet not all change involves aid programmes. A number of interviewees note that institutional changes are occurring in India as a result both of opening up the economy and of the private sector forming its own links with suppliers of new knowledge (possibly

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<sup>85</sup> See reference in footnote 82.

<sup>86</sup> "The charter of NAIP is to facilitate the accelerated and sustainable transformation of Indian agriculture for poverty alleviation and income generation by collaborative development and application of agriculture technologies by the public research organisations in partnership with farmers' groups, Panchayati Raj Institutions, private sector and other stakeholders. As one can see from the charter, the innovativeness of the project lies in its emphasis on holism (plough to plate), integration of basic, strategic, applied and action research, social re-engineering in terms of consortia formation and management and combining social, economic, ecological and participatory governance features": see <http://www.icar.org.in/naipdir/index.htm>.

<sup>87</sup> "The Andhra Pradesh Rural Livelihoods Project provides critical support to the ongoing watershed movement in five drought-prone districts in Andhra Pradesh. The mandate is to position livelihood concerns strategically in watersheds for the inclusion of women, the poor and the landless. The project advocates innovation, lesson learning, convergent actions and policy influence. APRLP will invest in a new stream of approaches and ideas for bringing about a positive change in the well-being of the rural populace": see <http://www.aplivelihoods.org/introduction.html>.

bypassing the ICAR). ICAR apparently started discussions about public/private deals in mid-1995.

## Tanzania

132. Of all the countries visited, Tanzania's researchers seemed to be the most satisfied (complacent?) with the current organisational and funding situation. This is not to say that the system was working particularly well or was well funded.

133. An important element of the crop post-harvest research system is the Tanzania Food and Nutrition Centre (TFNC), which is part of the Ministry of Health. However, the Ministry of Agriculture controls the research process but does not yet have staff qualified in crop post-harvest areas. At the time of the visit, the Ministry had recently set up a new Post-Harvest Unit, but had yet to recruit qualified staff. Publishing was said to be key to promotion decisions for researchers in TFNC, whereas in the Ministry of Agriculture's research institutes "salaries are a function of time served" (according to a staff member at the Lake Zone Agricultural Research Institute Ukiriguru).

134. The national co-ordinator for Roots and Tubers Research is now located within the Ministry of Agriculture's Sugar Research Institute, Kibaha. Funding comes from many sources (including IITA, DFID, CIP, NORAD (Norwegian Agency for Development Co-operation)). The role of national co-ordinator was said to have diminished with the move to 'competitive grants'.

135. Research at Sokione University of Agriculture is not controlled by the Ministry of Agriculture. The university applies directly to donors and is currently substantially supported by NORAD.

136. In contrast to Ghana, Tanzania appears to have considerable donor activity in support of crop post-harvest research. DFID's CPH Programme provides only part of the external funding from TFNC. Other donors include the Swedes, the World Bank and UNICEF (United Nations Children's Fund, which funds a major Vitamin A programme).

137. In recent years, there have been efforts to make agricultural research more 'demand-driven'. Research priorities are now set at the zonal level. Each institute has an annual Internal Programme Review (known as an IPR). A zonal technical meeting reviews the work of research institutes and their IPR. Zonal executive committees then manage the programme. However, no research priorities have yet been set at the national level. All submissions for competitive research grants have to be cleared by the zonal and regional co-ordinators.

138. It seems that the largest effort to fund and reform the agricultural research system is through the Tanzania Agricultural Research Project (TARP). A number of donors currently contribute to research under the framework set by TARP II. The Ministry of Agriculture said that the donors include the Swedes, NORAD, the Netherlands and DFID (though it was not known which DFID Programme).

139. The second phase of this Programme ended in June 2004 and appears likely to be succeeded by a Tanzania Agricultural Research Endowment Fund (TAGREF) to provide funds for research, as well as grants to rural producers; it will have a provisional capital budget of \$25 million. It is suggested that a number of donors, including the World Bank,

have shown interest in supporting this initiative. It will be administered by an autonomous body based in Dar es Salaam.

140. Research on cash crops is substantially better funded than non-cash crops. Extra funds are provided by a 'cess' or tax on exports and this is used to top up the fees necessary to keep staff in government research organisations. Irregular bonus payments are made annually to all staff (including drivers) in institutions working on cash crops. The bonus amounts to approximately 60% above normal salary rates. This implies that the salaries of researchers working on subsistence products are far too low. It is understood that current rules prevent top-up salaries being paid by external donors to staff researching subsistence crops. However, funds from externally funded projects to fund travel from the research station is regarded as very attractive.

141. Unlike Ghana, the British aid programme (principally through the Natural Resources Institute) did not have a long-standing research relationship on post-harvest research in Tanzania. NRI's Nigel Poulter provided the first contact and Andrew Westby did an initial needs assessment for the CPH Programme. This resulted in a memorandum of understanding and a workshop to prioritise the issues. Tanzanians said "we met as equals" and NRI ideas "complemented" Tanzania's ongoing work on roots and tubers.

142. A Tanzania Steering Committee, CPHP for Tanzania, was created and included the National Roots and Tubers Director, Sokoine Agricultural University and the Sorghum National programme leader. The TFNC acted as the Secretariat. A key Tanzanian informant said that the CPH Programme Committee worked well as it brought people and organisations together. However, they did not know if it would ever meet again. There is a suggestion that the committee may not have been really 'owned' by the Ministry of Agriculture, and that efforts are now underway to get the Ministry to run it on a permanent basis.

143. In the traditional (so-called 'linear') model of agricultural research, the impact of research is greatly influenced by the effectiveness of the extension system. In Tanzania, as in many other countries, the extension system has deteriorated in recent years. Under systems of decentralisation, management of extension services has now been taken away from the District Agricultural Officers in the Ministry of Agriculture and given to the District Executive at the District Councils, as the latter are said to be better suited to interpreting what farmers want. Ministry of Agriculture officials complained that "the Ministry of Agriculture can no longer tell extension people what to do", they "lose control and it weakens the process". They said that the links between "extension agents and research were OK", but they are underfunded, and do not have funds for transport. NGOs help with extension but are very unevenly distributed throughout the country and their impact is very localised. Some interviewees said that the extension system was very "over-committed", and they are sometimes seen as "tax collectors".

144. It was argued that reform of the extension has been driven by "foreigners": the "visit and training approach" had been replaced by the "farmer field school approach", which had now been displaced by "participatory research". Only now are people said to be comparing the effectiveness of these various approaches.

## Uganda

145. The overwhelming impression in Uganda, unlike in any of the other countries visited, was of a research system bent on reform. While it may be argued that the system had

deteriorated badly in previous years, and was therefore in dire need of reform, there was a strong sense of optimism and dynamism. There appeared to be a great deal of donor activity, including large World Bank programmes and a number of bilateral programmes often working through (overlapping?) networks.

146. Currently the National Agricultural Research system is controlled by a single central organisation, namely the National Agricultural Research Organisation (NARO) created in 1993. This has a number of 'operational arms' in the form of the national research institutes. NARO determines the level of participation and collaboration of other players (farmers, universities, NGOs, Community Based Organisations (CBOs), extension, private sector) in the setting of the agenda, formulation of programmes and implementation. The Ministry of Agriculture Animal Industries and Fisheries (MAAIF) provides guidance to NARO through a Board. All funding for research, whether from government or overseas donors, is routed through NARO. Major funding came from the World Bank Agricultural Research and Training Project (ARTP): other donors, including DFID (plus USAID and the EU), supported the attempt to increase the efficiency of the system.

147. Unofficial discussions suggested that NARO did not work well: researchers were paid badly (even when the salaries were paid by the World Bank project). NARO stopped the system of donor salary top-up arrangements. Conditions of service were poor and many people left. It was recognised that, to achieve reform (as in the other countries visited), there was a need to decouple researchers from the Civil Service conditions of service and to create more flexibility.

148. The principles guiding the Ugandan reform can be said to be allied with international thinking on National Systems of Innovation<sup>88</sup>. In particular, there is an attempt to shift control over funds to the 'users' of new knowledge and away from the suppliers of new knowledge, namely the research institutes. What are called 'consumer organs' are tasked with setting the agenda in terms of programmes and projects: this process is decentralised. Many types of organisation from the public, private and NGO sectors were encouraged to form partnerships to compete in providing research services. The idea of research through 'partnership' was said to be a key concept of the reform. However, some public-sector research institutes would be provided with core funding to undertake research of national strategic interest.

149. It is proposed to replace NARO with an overall umbrella organisation called the National Agricultural Research Council (NARC). NARC is tasked with forming a strategy for co-ordination, institutional development and networking of Research Service Providers. NARC would also provide grant support to facilitate the start-up of such groupings and associations.

150. The extension system is also being reformed and decentralised. Funding is being moved out of the Ministry of Agriculture and is to be directed by the Ministry of Finance directly to the local government level at which Farmers' Fora (FF) are located. The Farmers' Fora then instruct the local governments to issue service provision contracts, but the Farmers Fora are not part of the local governments.

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<sup>88</sup> *Proceedings of the Workshop on Reflection and Lesson Learning on Partnerships for Innovation*, 17–18 February 2004, Kampala, Uganda, compiled by Agnes Nayiga on the basis of the presentations made, particularly by Dr Clesensio Tizikara, Reform of the Uganda National Agricultural Research System: implications for partnerships: DFID Crop Post-Harvest Programme in East Africa



151. The National Agricultural Advisory Service's (NAADS) mission is to "To increase farmer access to information, knowledge and technology for profitable agricultural production". It is envisioned that NAADS is to "become a decentralized, farmer owned and private sector serviced extension system contributing to the realization of the agricultural sector development objectives". It was started in 2001 and involved a novel 'basket' funding arrangement, in which both government funds and earmarked budget support from the co-operating donors follow a Common Flow of Funds Mechanism, where the funds are pooled into a common 'basket' under the Government Consolidated Fund. The co-operating partners include the World Bank (International Development Association), the International Fund for Agricultural Development (IFAD), the European Union, DFID, the Netherlands and Irish aid.

152. In other countries, NGOs were looked on favourably as instruments to compensate for the failure of the extension system. In Uganda, however, it was suggested that there was really no alternative to a national agricultural extension service, even if it were largely in the private sector. It was suggested that "NGOs come and go: strong today and no trace tomorrow". This was to some extent supported by the evidence of the legumes project R7442, where the Matilong NGO was highly successful initially but subsequently suffered severe financial and other management problems.

153. Relations between the CPH Programme and the DFID office in Uganda have varied widely, largely on the basis of the individuals involved. In particular, many respondents referred to the work of Donal Brown, who created the Client Orientated Agricultural Research and Development Scheme, presumably through the DFID country budget.

154. The presence of a large number of overlapping (and possibly duplicative) research networks in the area of crop post-harvest was a major feature of the innovation system in Uganda. These include ASARECA (The Association for Strengthening Agricultural Research in Eastern and Central Africa). This is described as a non-political organisation of the National Agricultural Research Institutes (NARIs) of ten countries: Burundi, D. R. Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda. It aims to increase the efficiency of agricultural research in the region so as to facilitate economic growth, food security and export competitiveness through productive and sustainable agriculture.

155. Foodnet might also be thought of as a network but describes itself as "an Agro-Enterprise project linking ASARECA commodity networks in market oriented research". It is a project on post-harvest and marketing research for Eastern and Central Africa co-ordinated by the IITA, a member of the CGIAR. "The project is a new type of regional agricultural research and development network focusing on market-oriented research and sales of value added agricultural products". It seems to be largely/wholly funded by USAID through its Regional Economic Development Services Office. It is hosted by ASARECA.

156. It seems likely that the government will require all donors wishing to support research to put their contributions into a common 'basket'. These research networks provide a mechanism by which bilateral aid donors may be able to bypass such control. Membership of the ASARECA network is drawn from the national co-ordinators for research, as well as the scientists from the international research centres.

157. The CPH Programme has worked in collaboration with both Foodnet and ASARECA.

## Lessons Learned

158. What lessons can be drawn from this review of the national systems in which the CPH Programme's projects are located? Clearly the institutional and organisational context of research matters. It determines the choice, execution and impact of research. Comparing the situation in different countries highlights the similarities and differences and suggests areas in which intervention is likely to be most effective. Many of these will be explored in subsequent chapters.

159. Even this cursory review suggests that understanding these local contexts is crucial in determining the type and location of the most appropriate interventions, either at the project level, or in terms of building capacities and coalitions. Indeed, such a review points to the high potential impact of more explicit attempts to diagnose or 'map' the local systems of innovation, identify who else is trying to contribute, and to find the best niche for DFID's intervention. The CPH Programme's move to Regional Offices was presumably justified in terms of improving knowledge of the context in which project funding could take place<sup>89</sup>.

160. The CPH Programme is currently supporting a number of system or sub-system 'diagnoses' in India, Ghana and Uganda<sup>90</sup>.

161. Looking at systems of innovation, rather than research, suggests that a wider range of instruments is needed to support users of new knowledge, rather than a concentration on relatively small 'research projects'. There is a need to use what limited resources there are to leverage reform, strengthen the demand for new knowledge, and widen the range and type of participants in the process. Even in difficult research environments, the CPH Programme shows that it is possible to use project funding to induce change, and to encourage different people to work together.

162. The review also suggests important trends towards both 'budgetary support' rather than projects and programmes, and donor co-operation (or control), in which funds are pooled into a single funding basket. At one level, this demonstrates recipient governments trying to reduce transaction costs and to use donor funds in a more co-ordinated way. At another, it might be thought to limit the diversity of funding.

163. Perhaps the most unexpected impression from the country visits was just what a difference the internet and mobile phones can make. Some research partners, particularly the NGOs, were connected to fast internet connections and used them extensively to find information, to seek finance, and to network with other like-minded people. Others did not have this facility and appeared to be increasingly isolated intellectually. At one extreme, International Development Enterprises (IDE) in India was able to use the internet to find technical information, to identify potential coalition partners and even to raise funds. At the other extreme, was a government research institute in Africa that had the equipment for fast internet connection, but did not have a budget to cover the tiny monthly subscription to connect the system to an internet provider. In this case, staff members would drive into town from time to time to send and receive e-mail messages at their own expense, but

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<sup>89</sup> See paragraph 374.

<sup>90</sup> The system diagnosis in Ghana may well be too sensitive to publish, while the field work for the diagnosis in Uganda was completed in October 2005.

rarely, if ever, were they able to search the internet for scientific information or funding opportunities.

164. The mobile phone was ubiquitous, even among farmers' groups in villages with no electricity. While such technology will not overcome the huge forces that keep people poor, it does make a difference. At the least, the range of information and communication technology enables the networks to function more easily and this is an essential feature of effective innovation systems. It should also form an essential part of future DFID support to innovation.



## 6 Evidence from the Crop Post-Harvest Programme

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165. The purpose of this chapter is to review the experience of the Crop Post-Harvest Programme both in terms of a range of impacts and the extent to which the Programme adopted the IS approach. This will provide the basis for understanding whether, and in what sense, the IS ‘worked’ and what lessons can be learned from the experience.

166. When it comes to finding evidence of impact, researchers and those that fund them are faced with a well-known dilemma. On the one hand, there are persuasive arguments in the literature about why it is unrealistic to expect a one-to-one correlation between expenditure on a piece of research and a particular favourable impact<sup>91</sup>. Furthermore, there are numerous examples of research having unintended impacts, or impacts that resulted many years after the research was completed, usually as a result of their combination with knowledge from other sources. Even for the most famous cases of innovation, such as with transistors or vaccines, the time between new knowledge being created by research and the widespread use of the innovation can be 30 to 50 years. On the other hand, few researchers would want to argue that it was not possible to anticipate the impact of any research. For, if this were the case, there would be no rational way of deciding whether one research activity was to be preferred to any other. Certainly it is widely believed that research proposals can be appraised on the basis of past experience of the factors that increase the chances of success.

167. This review, together with the much larger study involved with the RNRRS Evaluation faced considerable difficulty in quantifying the impact of DFID-funded research, particularly in the area of poverty reduction<sup>92</sup>. The RNRRS Evaluation stated that:

*Direct evidence of the impact of RNRRS programmes on poverty is limited. (5.5.1). This evaluation can only repeat the findings of the earlier study – that at present the systematic evidence on impact is limited, but that this does not mean that there has not been, nor will there not be, real and significant benefits from these research programmes. Many of these project level assessments show real benefits at local level, but there is little, though increasing, information on the speed, and extent of uptake (5.5.10).*

168. This issue is discussed at some length in DFID’s own 2002 Research Policy Paper. This concluded that, while the impact of research on economic performance appeared very significant at the macro level<sup>93</sup>, it may not be possible in principle to establish impacts at the level of individual projects. It argues that “managers not aware of this evidence tend to

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<sup>91</sup> See, for instance, Raina, Rajeswari S, Disciplines, institutions and organizations: impact assessments in context, *Agricultural Systems*, 78, November 2003. This is described as the definitive critique of internal rate of return as a measure of agricultural research and the “futility of econometrics” (NISTADS, India).

<sup>92</sup> This was also the experience of the very focused impact review carried out for CPHP in Ghana by Michael Flint and Mary Underwood in November 2005 (forthcoming).

<sup>93</sup> One recent study by the International Food Policy Research Institute (IFPRI) suggests that additional investments in agricultural research (in China, India, Vietnam and Uganda) reduce poverty more than any other investment in rural areas, including roads, education and health. Meinzen-Dick, R, M Adato, L Haddad, and P Hazell, Impacts of agricultural research on poverty: findings of an integrated economic and social analysis, Environment and Production Technology Paper No 111, International Food Policy Research Institute, 2003.

have unrealistic expectations of the ‘impact’ that a particular piece of ‘research’ should have” (paragraph 16), and that “the estimation of the impact of research is probably less about finding appropriate indicators than in understanding and improving the processes of ‘institutional learning’ and the degree to which research-based knowledge is incorporated into decision making, or (in the case of technology) is extensively applied” (paragraph 60).

169. This is probably all beyond the point. For one of the implications of the innovation systems literature is that the impact of research is the result of many factors, most of which are outside the control of individual researchers.

170. The important conclusion for this study is that, without this kind of evidence of impact at the project level, it is particularly difficult to demonstrate that one approach has more impact than another. Yet, as the RNRRS Evaluation states, this is not to say that there were no impacts, merely that these impacts are often qualitative, diffuse, cumulative over long periods of time, and difficult to attribute to particular research inputs. This means much has therefore to be inferred or interpolated.

171. However, all is not lost. Despite the lack of quantitative evidence of impact, there was much qualitative evidence of a wide range of impacts. In addition, almost all the people interviewed believed that the new approach is more likely to lead to innovation (and thereby poverty impact) than the previous more conventional research funding mode<sup>94</sup>. This support is not surprising, given that the approach itself is based on the experience of achieving innovation in a wide range of countries and sectors. What is surprising is just how many ‘obvious’ partnerships had not been formed before, even if the parties knew each other well.

### An Attempt at an Impact Matrix

172. Despite these well-known methodological problems, the initial idea was to compare two sets of indicators for a large sample of the CPH Programme’s old and new projects. The first set of indicators was based on the ‘normal’ impact indicators used in the CPH Programme’s Final Technical Reports (see Annex 3). The second set was indicators of the extent to which each project contains the elements of ‘best practice’ defined by the National Systems of Innovation literature – that is, its ‘NSI-ness’<sup>95</sup>. It was hoped that, by comparing the two sets of indicators across a large sample of projects, it would be possible to provide insights into the key task of the study as to whether the new approach is in some sense more effective than the previous, more traditional one.

173. The NSI scores were designed to be cumulative, in the sense that those projects that exhibit more indicators could be said to have the greatest chance of achieving innovation. They were sequential, in the sense that that each indicator is easier to achieve than the indicator that follows.

174. The application of these two sets of indicators to the sample of projects proved difficult. It turned out that the impact indicators were far more difficult to define and apply

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<sup>94</sup> Almost all the critical voices came from people based in UK institutions. However, their criticisms appear to be more about the way the approach was applied than the approach itself. This is confirmed by the evidence cited by the RNRRS Evaluation, page 371.

<sup>95</sup> Initially, the term National Systems of Innovation (NSI) was used since it was used in the literature, but this was changed to Innovation Systems (IS) as the study progressed, because this better reflected innovation systems at the sub-national and project level, hence ‘NSI Scores’.

than the IS indicators. Furthermore, it proved very difficult to apply the criteria consistently. For instance, it became clear that, although a small project might have been described as having a considerable effect, relative to the size of the project, it was misleading to give this the same score as a large project that had helped many more people, but was judged to have had only a moderate effect<sup>96</sup>.

175. It also became clear that the passage of time was a major complicating factor in classifying the portfolio. Recent projects may well not have sufficient time to demonstrate significant change of any sort. This complication was compounded in practice by the fact that it was not possible to separate out the projects in terms of whether they were, or were not, 'Partnerships for Innovation' that were started after the watershed year of 2002. This was because many projects were part of a sequence of projects or project clusters that started before 2002 and ran on to the end of the Programme. In practice, the post-2002 projects were almost entirely continuations of earlier projects funded by the CPH Programme.

176. Although there are very obvious weaknesses in the approach, initial analyses of the Ghana data did find a moderately strong correlation (0.66) between impacts and IS scores. However, the analysis exposed the subjectivity of the scores and a significant degree of autocorrelation (both scales, for instance, include poverty measures).

177. By far the biggest problem was the difficulty of establishing impact scores, and the relatively low scores of those that could be scored. Most of the direct poverty-reducing impacts occurred to those (often farmers and traders) who were directly involved in the research, usually a few hundred people or less<sup>97</sup>.

178. As suggested earlier, this lack of measurable impacts has been experienced by all other attempts to measure the impacts of RNRRS research at the project level. In one sense, this does not matter, as we know that even the most effective research takes time for the full impact to work through the economy. In another sense, it does matter, as it is likely that future funding will be influenced by, if not determined by, those types of activity that can credibly argue that an extensive impact is likely – and there will be some projects of this type. What it did mean was that the Impact Matrix could not be implemented, and was therefore abandoned. However, the indicators do provide a useful heuristic device.

## Innovation Systems in Practice

179. Despite the difficulties of measuring impact, the CPH Programme's projects had substantial and varied impacts. These include policy change, institutional learning, changes in practice, and scientific knowledge of relevance to the scientific community, extension services and NGOs. However, some project impacts were difficult to classify. For instance, the yam projects in Ghana<sup>98</sup> did add to knowledge and enabled the Ministry

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<sup>96</sup> Attempts were made to overcome this by amending the scoring system to involve absolute values, for instance, score 0 if between 0 and 100 people are impacted, score 1 if between 101 and 1000, score 2 if between 1001 and 500,000 and score 3 if more than 500,000.

<sup>97</sup> A number of projects did record impact. For instance, the project in Mozambique undertook 77 training sessions, and 2000 farmers were trained. This was said to have improved the lives of 6775 households and the FTR asserts that 481 households had raised incomes. Care International was said to be about to do an evaluation of its whole scheme, but this is not yet available. The Sweet Potato project in Uganda (R8273) says that it trained 17,030 farmers, though there is no evidence of whether the training increased incomes.

<sup>98</sup> R7582 Development of integrated protocols to safeguard the quality of fresh yams – Ghana.

of Food and Agriculture to understand the yam market and farmers' needs much better. Nevertheless, the project failed in its attempt to find a way to 'cure' the yams to thicken their skins, heal wounds and stop deterioration (the research proved a negative). Similarly, the fumigation of roots and tubers stored in sacks in Ghana<sup>99</sup> was shown not to work. In this case, the negative results were particularly important to help stop a practice that was highly toxic to humans.

180. Length and clarity in this report do not permit a description of all the projects that were reviewed. What follows is therefore an attempt to select the CPH Programme's projects that best exemplify both the types of impact encountered and the lessons learned for the Innovation Systems approach.

### *Early CPH Programme Projects that had Impact and Contain Many Elements of the IS Approach*

181. The analysis was able to confirm an important initial hypothesis, that some of the early projects that did not consciously adopt the 'coalition' or IS approach were successful and did involve many of the characteristics of an effective innovation system. These projects also appeared to be self-sustaining and to have a number of impacts, including on poverty reduction. This evidence provides initial support to the view that conscious efforts to design projects to include elements of best practice in innovation are likely to have greater impact than those that do not.

182. Perhaps the most extreme example of this phenomenon was the interaction between the Fruits of the Nile Company in Uganda and NRI. Unlike many traditional research projects, which are largely supply-driven, this Uganda-based small enterprise requested technical advice from NRI for improving the drying of fruit for export to the UK. This case exemplifies the 'demand-driven' innovation process. The company broadly knew what help it wanted, and had existed as a business for some time. There had been an ongoing research project that addressed these issues and the enterprise was able to respond<sup>100</sup>. This intervention was said to be critical in enabling the Fruits of the Nile company to thrive<sup>101</sup>. However, the company has many unique features that has enabled it to break into the UK market and that make this particular scheme difficult to replicate (not least because of strong trust relations between the British and Ugandan partners and consequently low transaction costs). The company has also sought and received technical and other inputs from many other sources (particularly associated with the Fair Trade movement)<sup>102</sup>. It is interesting that, while this NRI project also worked in Ghana at the same time, it was reported that the technology was not taken up there<sup>103</sup>. This suggests the importance of the 'demand' for new knowledge that needs to be matched by the supply.

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<sup>99</sup> Taylor, R W D, Mud-based silos: farm stores for silos (Ghana), Natural Resources Institute (NRI) UK, R6502, March 1996–July 1999.

<sup>100</sup> Orchard, J, Low-cost fruit and vegetable drying technologies (Ghana, Uganda, Pakistan), Natural Resources Institute (NRI) UK, R5539CB, October 1992–March 1996.

<sup>101</sup> In January 1995, Fruits of the Nile held a series of seminars on Running Solar Drying Businesses in association with the Natural Resources Institute (NRI) of the UK, and the Kawanda Agricultural Research Institute (KARI) in District Farm Institutes in Uganda. A mixture of hands-on practical training in the construction of solar driers, and the processing of the fresh fruits as well as in business management, these seminars were well attended and have led to the publication of a manual on Solar Drying Businesses (July, 1996).

<sup>102</sup> [http://www.fmfoods.co.uk/tw/partner\\_uganda.htm](http://www.fmfoods.co.uk/tw/partner_uganda.htm).

<sup>103</sup> West Africa Regional Office, personal communication.

183. Other examples of successful innovation were found in India. As suggested earlier, India's huge scientific and technological capability make it well suited to an innovation approach that unlocks this knowledge into profitable goods and services. Furthermore, the South East Asia Regional Office had a clear idea about what was involved in innovation thinking and were therefore able to identify and record successful innovation processes<sup>104</sup>.

184. One of the most interesting 'innovation' projects that was identified by the Programme and written up to learn the innovation lessons was the Kerala Horticultural Development Programme (KHDP)<sup>105</sup>. This was a project funded by the EU with the objective of improving the overall situation of vegetable and fruit farmers of Kerala. In this case, either by chance or intention, the Programme in effect followed one of the tenets of best practice in innovation by strengthening the 'demand side' of the knowledge equation. The EU made its funding available to what was essentially the user of knowledge, KHDP, rather than directly to the research institute, the Kerala Agricultural University (KAU). KHDP was a new organisation set up to manage the funds and to provide many services, including research and development (R&D), provision of planting materials, extension service and demonstration plots, training, credit packages, marketing support, and a processing unit.

185. A key to KHDP's strategy was to establish partnerships with key stakeholders, such as farmers, through Self-Help Groups, banks through innovative credit plans, and traders through repeated negotiations on the value of co-operating with farmers' markets.

186. The KHDP model was said to have "faced many challenges and ultimately failed". However, by giving the research funds to the user of new knowledge rather than the supplier, there appears to have been a profound effect on the way the research was carried out (including topics, timing and types of output), but it also meant that the research was rapidly taken up and used.

187. The second Indian case formed part of the CPH Programme's project portfolio. This project contained many elements of the innovation approach, even though it started well before the formal shift to the coalition approach. This was concerned with the sustainable retailing of post-harvest technology to the poor and explored alternative institutional mechanisms for developing and transferring technology<sup>106</sup>. This ran from July 2001 to December 2002 and was undertaken by the international NGO International Development Enterprises, India (IDE-I).

188. IDE is best known for its very commercial approach to the supply of millions of treadle pumps in India. In the CPH Programme's project, it acted as an 'intermediary' to facilitate the interaction between the many actors necessary to innovate in crop post-harvest systems, in ways that benefited relatively poor farmers. Through a form of systems diagnosis that focused on a particular group of farmers, IDE came to understand that a major bottleneck in the marketing of tomatoes was the lack of appropriate

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<sup>104</sup> Hall, A, Optimising institutional arrangements for demand driven post-harvest research, delivery, uptake and impact on the livelihoods of the poor through public and private sector partnerships (India), Natural Resources Institute (NRI) UK, R7502, October 1999–March 2003.

<sup>105</sup> Sulaiman, R V and M Pillai, Kerala Horticultural Development Programme: a learning-based approach to technology development, promotion and rural innovation, in *Post-Harvest Innovations in Innovation: reflections on partnership and learning*, eds. A J Hall, B Yoganand, R V Sulaiman and N G Clark, pp. 19–31, DFID Crop Post-Harvest Programme, South Asia and Natural Resources International Limited, 2003.

<sup>106</sup> R7551.



packaging. The government had been provoked to stop the use of wooden tomato crates (as these were having a harmful effect on the trees in the Punjab) following the massive growth in off-season tomatoes in the mid-hill region<sup>107</sup>.

189. Staff at IDE said that they “do not do research as such”, but proved to be really effective networkers, conforming almost perfectly to the model of an ‘intermediary organisation’. They knew what they did not know, searched and found a key player (at the Institute of Management) and then brought it all together in a financially sustainable delivery system. This project had substantial impacts and was said to have involved the commercial supply of up to 200,000 cardboard boxes in the project area in the two key months<sup>108</sup>. This approach, and the evidence supporting it, have apparently been widely disseminated. Another impact claimed for the project is that the long-standing work on packaging at the Indian Institute of Management in Ahmedabad (IIM(A)) now works in a different and more effective way and IIM(A) is more generally said to be more outward looking.

190. Even some of the older projects that appeared to be in the traditional linear mould could often interact strongly with other players in the innovation system. For instance, the documentation associated with the peanut butter work in Zimbabwe appears to be very ‘linear’ by offering some very general ‘recommendations’, with the expectation that some other agency will disseminate them to a target audience<sup>109</sup>. In practice, though, the project was far more ‘interactive’ and with strong ‘coalitions’ among the university, the machinery manufacturer and the standards authority. Particularly interesting was the role of the private-sector company in making and selling the machine for profit. This company, Tanroy, provides training to all buyers of their machines not only on the operation of the machine but also on business development of the users.

191. Lack of hygiene was identified (by the researchers) as a major constraint to selling to higher-value outlets such as supermarkets and the “key to accessing these markets was to meet the food laws and Standards Association of Zimbabwe certification” (p2, FTR)<sup>110</sup>. It also appeared that there was a complex market structure that resulted in an active demand for the peanut butter processing machines despite a cost–benefit analysis carried out for the project concluding that they were not profitable.

### *Pre-2002 Projects that Evolved into Effective Coalition Partnerships*

192. The industrial uses of cassava starch in Ghana also showed many of the characteristics of innovation best practice from an early stage, and increasingly worked

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<sup>107</sup> Early drafts of the project documentation apparently did not even mention the word tomato, nor did it mention the names of project partners. Indeed the project was said to have been turned down initially by the PAC on the grounds there was “no technical constraint”. However, as the project leader said: “The project is not about boxes it is about a process”.

<sup>108</sup> In the following year, there was a drought (expected only once in ten years) and no boxes were used at all. The project impact is no longer monitored and so no information is currently available.

<sup>109</sup> Rukuni, T. Raising rural family incomes through improved peanut butter processing (Zambia, Zimbabwe), Development Technology Centre (DTC), University of Zimbabwe, Zimbabwe, R7419, October 1999–September 2002.

<sup>110</sup> The major finding of the research was that the aflatoxin levels of small-scale production were no worse (actually better) than commercially produced peanut butter. However, there were higher levels of E-coli and salmonella. Significant institutional change was said to have occurred in relation to the standards authority. “Of special mention is the willingness of Standards Association of Zimbabwe to assist rural entrepreneurs attain their license and certification” (page 145 of report cited in footnote 109). Nevertheless, no information was available on the number of peanut butter producers who have been registered by the standards authority since the project started.

with industry partners (often on their premises) to explore product options<sup>111</sup>. The principal Ghanaian researcher commented that “industrial trials strongly influence the nature of the research, because the industrialists have already tried many things and know a great deal already. So the research must respond to what they need to know”<sup>112</sup>.

193. This cluster of projects also illustrates a number of issues concerning the innovation approach. Many of the products that were initially identified by the researchers were found to have only limited commercial application. These are important findings. For instance, the use of cassava flour in baking increases the risk to the baker by presenting problems of more rapid staleness; promising markets for glucose syrup were constrained by the costs of vacuum evaporators to achieve the clear colour required by customers; and the cost of underwriting the trials to test cassava-based adhesive for cardboard box manufacture proved too high for the project. This research theme also illustrated the importance of the international context in which innovation takes place. It appeared that the option that was promising commercially was the use of cassava starch in the manufacture of plywood. However, it seemed that cassava-based adhesives had difficulty in matching the price of starch-based ones on other products that were subsidised by US PL480 products.

194. Another example comes from the cluster of projects concerned with informally vended foods and probably represents one of the highlights of the CPH Programme. This cluster of projects has run for many years, initially starting with a scientific focus on establishing the extent of the risk, but slowly evolving into effective national coalitions, combining scientists with food vendors and the various regulatory authorities. It would appear that, as the project evolved and the scientists engaged more formally both with street vendors<sup>113</sup> and the regulatory authorities, the nature of the research shifted from herbicide residues<sup>114</sup> and heavy metals<sup>115</sup> to issues of food hygiene and bacteriological contamination<sup>116</sup>. However, a key to the success of the activity would appear to be the engagement with the regulatory authorities, such that the food inspectors (environmental health officers) were transformed from being threats to the vendors to being allies in the battle to improve food hygiene. The final coalitions were also able to reconcile a number of the conflicts that traditionally would have prevented innovation – this was said to be

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<sup>111</sup> Initially, the project linked traditional ‘food research’ institutions with other research groups at the universities and at the Forestry Research Institute of Ghana (FORIG) Ghana with the National Board for Small-Scale Industries and the Ministry of Food and Agriculture (MoFA) Ghana. By the final phase in 2005, this group had been expanded to include the Association of Productive Entrepreneurs in Development (APED) Ghana Cassava Processing Groups, Atebubu, ROSEAFRIK Ltd, Ghana, Amasa Agro-Processing Company Ltd, Ghana, Feed and Flour Ltd, Ghana, Bakers Associations, Atebubu, Ghana, the Ayensu Starch Company, and Golden Biscuits.

<sup>112</sup> Dr Nanam Tay Dziedzoave, FRI, interview, 29 September 2005.

<sup>113</sup> Enhancing the food security of the peri-urban and urban poor through improvements to the quality, safety and economics of street-vended foods (Ghana), Natural Resources Institute (NRI) UK, R7493, November 1999–October 2000 (with FRI but no other coalition members listed).

<sup>114</sup> Graffham, A, Improving quality assurance systems for fresh fruits and vegetables produced by peri-urban resource poor farmers in Zimbabwe (Zimbabwe), Natural Resources Institute (NRI) UK, R7528, January 2000–June 2003. “Analysis of samples of leafy vegetables and tomatoes grown by communal farmers in Zimbabwe indicated that pesticides are unlikely to represent a food safety problem”.

<sup>115</sup> Cadisch, G, Pollution and health problems in horticultural production in Harare: the need for improved quality assurance systems (Zimbabwe), Imperial College at Wye, UK, R7519, January 2000–March 2004.

<sup>116</sup> Tomlins, K, P-N T Johnson, R M Zulu, D Chibanda, A Graffham, Developing food safety strategies and procedures through reduction of food hazards in street-vended foods to improve food security for consumers, street food vendors and input suppliers (Ghana), Natural Resources Institute (NRI) UK – Food Research Institute (FRI) Ghana, R8270, January 2003–December 2004. Also, Improving food safety of informally vended foods in Southern Africa, R8272, January 2003–December 2004.

particularly significant in Accra<sup>117</sup>. It is to be hoped that during the final phase of this cluster these projects can not only extract the key scientific lessons learned, but also the key lessons about the process by which the various innovations were achieved<sup>118</sup>.

195. It is perhaps important to stress that the ‘science’ was probably very important to this process, in particular, to persuade city authorities that street vendors were here to stay – it may have needed external actors (not just foreigners) to ‘prove’ this. Furthermore, the research in Harare showed that contamination was significant (14% of samples) but not catastrophic, so it was worth improving hygiene, rather than eliminating the vendors. The Zambian contamination appeared higher, but was more concentrated in the central market.

196. Similarly, there will be times when the scientists are trying to set the agenda, and are necessarily ahead of what the regulatory and other authorities believe to be the important issues. This may well have been the case with the air pollution project in India, which looked to see if heavy metals were present in fruit and vegetables<sup>119</sup>. The CPH Programme’s project had two elements: one was associated with high-quality scientific research, while the other was based on an NGO (Toxic Link) in order to influence the policy process more effectively. Important research results appear to have been produced by both strands of the project. However, as the managing partner said, as the work began in 2000, “the project wasn’t designed to form one particular type of partnership ... we did not sign up to a new approach, [as] we began the work in 2000 prior to the formalisation of a ‘new approach’”. The project was not designed to complete specific tasks concerned with institutional learning. However, they “did liaise regularly with regulatory authorities during the project but they were not named as core project partners in the documentation”<sup>120</sup>.

### *Successful Coalition Projects Leading to Innovation*

197. Perhaps the most dramatic example of success resulting from what might be described as a ‘CPH Programme-inspired (or even forced) coalition’ concerns the sorghum project in Hyderabad. There have been many efforts over the years to improve the income to poor farmers who grow sorghum<sup>121</sup>. The latest project funded by the CPH Programme enabled the researchers at ICRISAT to work in novel ways with poultry feed

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<sup>117</sup> R8270.

<sup>118</sup> Tomlins, K and A Graffham, Maximising impact of food safety knowledge of street vended and informally vended foods generated by CPHP projects in West and Southern Africa using the coalition approach and extending the approach to India (Ghana, India, Zambia), Natural Resources Institute (NRI) UK, R8433, January 2005–December 2005.

<sup>119</sup> R7530, Enhancing food chain integrity: quality assurance mechanisms for air pollution impacts on fruit and vegetable systems, India.

<sup>120</sup> The Managing Partner made a number of useful comments on this. The following are excerpts of a longer set of comments:

“We recognised that in advanced economies, consumer awareness of the incidence of contaminated food products and the associated health risks has been the principal factor that has boosted demand for safety as a food quality attribute. Information and incentives will also play a part in food quality assurance mechanisms, and will be very important in India, where the current regulatory environment is weak.”

“A great deal of thought and discussion was put into the social, economic and political context of our project and specifically into the processes that would most effectively ensure integration of the many strands of the project. Whilst the academic integration might not have been perfect within the team, all the team members made a very significant journey in this respect. Some had never worked in an interdisciplinary environment prior to this initiative, but are now comfortable to do this, and to engage in a wide range of fora to debate the design of studies, the relevance of findings to wider livelihood concerns and its significance to public policies and programmes”.

<sup>121</sup> Reddy, K Gurava, P Parthasarathy Rao, Belum V S Reddy, A Rajasekher Reddy, Acharya N G Ranga, C L N Rao, P Chengal Reddy, Ch Janardhana Rao, Enhancing technology generation and transfer through coalition approach: A case of sorghum poultry coalition, Andhra Pradesh, India.



manufacturers, to convince them (with high-quality science) that sorghum that was not fit for human consumption (mainly because of mould) could safely be fed to chickens and could substitute for high-cost maize<sup>122</sup>.

198. The feed manufacturer sells approximately 3,000 tons of poultry feed a month. Currently, he is able to replace all the maize with sorghum (plus 3% stylo – a green leaf – to improve the colour of the chicken meat as this is what the buyer wants). The sorghum is purchased in lots up to ten truck loads a month from a middle man. The Farmers' Federation is also involved in the coalition to organise Farmers' Clubs to sell sorghum in bulk to the feed manufacturer and to improve the quality of the grain supplied. The coalition is said to enable the “the farmers now [to] get access to the research director”.

199. This coalition massively strengthened the “demand side of the system”, and the feed manufacturer was able to change the nature of the research, by both demanding research results sooner and requiring them in terms of ‘part-by-part’ recipes, rather than in terms of micro-nutrients that the researchers wanted to supply. While important scientific work had been undertaken on sorghum for many years, it is believed that the pressure from the CPH Programme and its funding enabled the various partners to work formally together for the first time and to convert the knowledge into profitable goods.

200. Another successful innovation project was undertaken by International Development Enterprises (India) who formed a coalition with a local university (The Orissa University of Agriculture and Technology – OUAT) and a local NGO (The Centre for Community Development – CCD). It was described as an “action research project” to explore and develop a management system for linking tribal communities to markets through ‘value addition’ (R8266). It looked at the prospects of a large number of agricultural products, including pineapples and tamarind.

201. A series of innovations was identified that would enable tribal people to add value to their crops and market them to a large-scale food processor. As the project progressed, they were able to take advantage of selling semi-processed products to OMFED (The Orissa State Co-operative Milk Producer's Federation Limited<sup>123</sup>). The project was able to combine the scientific and technological capacities of the university, together with the detailed knowledge of the rural people's capabilities to improve the quality of their products. This gave them the confidence to approach OMFED and win supply contracts that they had not felt was possible at the outset of the project.

202. The project appears to have had the greatest ‘institutional innovation’ on the University, although it has had some difficulty in articulating the change. For instance, the University has participated in the long-standing government process of innovation and this has had its successes – for instance, the selling of 30,000 power threshers. The existing system is complex, long-winded, and highly subsidised. The University said that the CPH Programme coalitions were a better approach and had the following innovative aspects:

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<sup>122</sup> Interestingly, the private-sector person interviewed was involved (unsuccessfully) with an application to the DFID Business Challenge Fund. This suggests an opportunity for more ‘joined up’ DFID activity between research and programme activities. In relation to the science, he said that he wanted “part-by-part” recipes for the chicken feed, rather than the complex micro-nutrient data favoured by the researchers.

<sup>123</sup> This is an apex-level Dairy Co-operative Society to promote, produce, procure, process and market milk, milk products and other produce for the economic development of the rural farming community in Orissa: see [www.omfed.com](http://www.omfed.com).

- This was the first income-generating project the University had ever had and this created highly motivating incentives both for the University and the staff (the fee was split 50:50).
- The coalition approach was far more flexible than the government system. This meant that they were able to exploit opportunities as they emerged. For instance, the project switched from pineapples to other products – tamarinds, juices etc – as this was seen to offer better prospects for the farmers.
- There was said to be much more rapid (and continuous) interaction with the tribal people that was made possible with the link to the CCD NGO.

203. Despite the apparent success of this project, it does point to a possible danger of projects managed by intermediaries. In principal, they should have been able to draw on a wide range of scientific and technological expertise from the University. In the event, this may well have been limited and they were in danger of re-inventing the wheel. For instance, the osmo-dehydration was ‘discovered’ by chance by IDE who ran across it in Thailand<sup>124</sup>. OUAT described this process (essentially soaking the fruit in sugar solution for eight hours prior to forced air drying) as “unknown in India”, and said that the process was a “trade secret” of the Thai firm that they had managed to reverse engineer<sup>125</sup>. Similarly, they were unaware of other scientists and technologists working on cashew apples. Perhaps more seriously, the team seemed unaware of the food hygiene standards that were required (though they may have been relying on OMFED to know about them and to ensure that they were met)<sup>126</sup>.

#### *Coalition Projects that might have had more Impact if they had Adopted the Innovation Approach*

204. A particularly striking trend in the review of the CPH Programme’s projects was the difficulty they had in developing and introducing ‘machines and equipment’. In a large number of early ‘traditional’ CPH Programme’s projects, researchers developed equipment apparently without involving manufacturers, suppliers or credit agencies that might have been predicted to be likely to be required for successful innovation. This is particularly apparent in the cassava chipper projects, the rice parboiling project in Ghana, and grain storage bins in India. In a number of cases, such as the rice parboiler, attempts have been made to get round the lack of suppliers by relying on the activities of NGOs financed by government and aid grants to buy and distribute the equipment<sup>127</sup>. In other cases, such as in northern Tanzania, there is a marked absence of some of the elements of the innovation system (such as micro-credit facilities); this considerably restricts the impact of research output<sup>128</sup>.

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<sup>124</sup> India’s National Institute of Industrial Research (NIIR) provides knowledge and technical assistance about the Dehydration of Fruits and Vegetable by Osmodehydration Process. Its web site says that while “this technology is not well established in India ... osmodehydration process ... is more economic and beneficial to processors”: see [www.NIIR.org](http://www.NIIR.org).

<sup>125</sup> Although the process does seem to have many advantages in converting the local sour ‘kew’ type of pineapple into an attractive product, this product has not been commercialised so far.

<sup>126</sup> A video of this project shows unhygienic practices in the processing and packing of tamarind – personal communication Dr Vino Graffham, November 2005.

<sup>127</sup> It should be noted that some of the people interviewed were optimistic about the ability of this project to attract the necessary funds. However, it was reported that, although the potential users thought the technology would be very helpful to them, its cost was likely to be prohibitive. It is not clear [yet] whether early discussions with existing manufacturers of aluminium vessels might have found a cheaper way of achieving the same technical results.

<sup>128</sup> The project is now working with TAMEA – a relatively small micro-finance NGO. See R7497, Commercialisation of cassava processing to enhance rural livelihoods in Eastern and Southern Africa (Mozambique, Tanzania), October 1999–February 2003.

205. There is now a great deal of experience around the developing world of the limitations of this ‘supply–push’ research, and on the whole the impacts have been limited. The question is whether or not the CPH Programme’s projects have added to this understanding.

206. The cassava marketing and packaging project in Mozambique illustrates this problem well<sup>129</sup>. Many people regard this as an important and innovative project. The main innovation was the development and introduction of a new extension model in which an NGO is contracted by the government to provide extension services<sup>130</sup>.

207. The project also involved the introduction of cassava chippers and other equipment<sup>131</sup>. This activity was to “establish a local and sustainable supplier network for low-cost processing equipment and packaging materials”. However, the project appears not to have had, or tested, an explicit model of how to introduce new technology. The coalition did involve a private equipment supplier and this was itself highly significant and innovative. There was said to be no credit available in the project area and the private supplier was not prepared to offer credit. Thirty three cassava graters were imported from Brazil (at a cost of \$80 each) and given to the farmers. The private supplier wanted to introduce powered machines. There is no grid electricity in the area and all motors are diesel. The project’s market survey suggested that the manually operated machines would be better and the supplier “came round in the end”. Nevertheless, the project did not report success in developing an effective supply chain.

208. A similar problem is illustrated by the case of the Diatomaceous Earth (DE) project<sup>132</sup>. This project involved high-quality science, which has been widely published as an international public good. Initially, this appears to have been a classic ‘science driven’ project, but, in this case, it was essential to use science to explore the effectiveness of these talcum-like dusts in killing insects before embarking on commercialisation.

209. As the project evolved, it shifted towards the coalition model and to commercialisation of DE. The product that is currently used by farmers in southern Africa is Actellic Super Dust (a mixture containing *pirimiphos methyl* and *permethrin*), and the research question is whether the farmers would replace with DE either because it is cheaper or less toxic to humans

210. The main work recently has been to register an imported DE product that has been shown to be effective. The real benefit would come from local production of the dust; this would possibly lower its cost. However, local production seems to be a very long way away, not least because of the cost of mining, regulation and production. It is possible that using the imported material will convince the mining company to proceed, because there is a demonstrable market. It is also possible that the costs of opening up the mine will be paid, because the product is also used in other industries (paints etc).

211. However, it is not clear what motivates the local private company that is currently seeking registration of the imported product and is part of the coalition. It seems a rather

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<sup>129</sup> R8283, Packaging and Processing of Sweet Potato and Cassava.

<sup>130</sup> Regrettably, the lessons learned from this experiment were not reflected in the final project documentation.

<sup>131</sup> Including manual hand graters, manual choppers, clay toasters (Jinjalo), sieves, hand presses.

<sup>132</sup> R7034, Grain storage management using inert dusts; R8179, Small-scale farmer utilisation of diatomaceous earths; and R8460, Post-harvest innovations; enhancing performance at the interface of supply and utilisation.

long shot for them, and, given that they supply the main alternative product Actellic Super Dust, it is not clear that they will make more of a profit with the new product than with the existing one. The situation may well change over time, as there has been a genuine increase in knowledge (that is an international public good) that may be taken up eventually.

212. The DE product (and therefore the project) has been stymied by difficulties in getting the product registered for use. The question is whether the adoption of the innovation systems perspective earlier in the project would have made a difference, either in suggesting that the project should have been terminated with the publication of the scientific results, or whether the network of actors could have been used more effectively. The institutional barriers to commercialisation in both Zimbabwe and Tanzania would appear to be classic examples of failures in parts of the innovation system preventing the impact of good science. The Zimbabwe coalition still does not include the key regulatory players or the likely local producer (the mining company). In Zimbabwe, it is considered unethical to involve the regulatory authority, although the regulator is involved in Tanzania. Zimbabwe has recently involved the Farmers' Union in the coalition as a mechanism for putting pressure on the regulators.

*Coalition Projects that Focused on Impact to the Exclusion of 'Research' and the Need to Invest in Extracting Public-Good Knowledge*

213. The project in Mozambique also exhibited characteristics that were common in most of the post-2002 coalition projects. This was that the more they focused on achieving short-term poverty impact the less they invested in 'research' and the extraction of lessons of use to others both within the country and internationally. The Programme manager of the project in Mozambique reported that the project produced "no scientific outputs".

214. This issue is well illustrated by the rural transport project in Kenya (R8113). This is again regarded as a highly successful project that has developed a major institutional innovation in terms of 'community parliaments'. This is a mechanism for involving local communities more effectively in placing demands on the research system (and indeed other parts of the government process of decentralisation). In the first phase of the project, a large number of reports were produced on the basis of surveys. Before they could continue to the second phase, the project was subjected to an external evaluation. One of the evaluators was delighted with all the research, but the other called a halt to all this 'research' and suggested that they should do what they did best, namely, participative rural appraisal (PRA) "as this was more important than research". The researchers were clearly being given mixed messages. During the final phase of the project, there has been next to no 'research' output in the sense of analyses and conclusions that might be of use to others. One team member stated: "We lost track of the research because of the pressure to deliver impacts". The project exhibited a great deal of 'learning by doing': it was the first time many of the participants had collaborated with the private sector; and the managing partner has learned that they must go "beyond roads" and get into marketing and other services that best meet the people's needs. So far, little value has been added to this experience by setting the work in the wider context of experiences elsewhere and the context of the wider literature.

215. Such projects led one DFID staff member to conclude "*C'est magnifique* (mostly!) – but how far is it research?"<sup>133</sup>. A review of the recent CPH Programme's projects supports

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<sup>133</sup> DFID, Back to the Office Report, 5 August 2004.

this conclusion more generally. Indeed, this is probably one of the main findings of the analysis. However, many of the CPH Programme's projects, particularly those in India, show that this is not a necessary consequence of adopting an innovation approach. This report will show that it is possible to achieve both poverty-reducing innovation and public-good knowledge in the same project. Indeed, there are likely to be opportunities to add this value to existing CPH Programme projects in the coming months and years. These issues will be explored further in the following section, and again in Chapter 7, where specific actions will be proposed about how public-good knowledge can be generated from innovation projects.

### *Impact in the Form of Institutional Change and Learning*

216. A major impact of the current batch of projects is that they are designed to produce 'institutional learning' as well as more traditional scientific outputs (see paragraph 72 above). Hall and others define the concept of institutional learning as referring to "the process through which new ways of working emerge. It concerns learning how to do things in new ways. It asks the question 'what rules and norms have to be changed to do a new task or to do an old one better?'"<sup>134</sup>.

217. Most of the post-2002 portfolio of projects is designed to produce this 'institutional learning'. Project documentation made such outputs 'compulsory' for all the new projects in both Africa and India. Procedures were also put in place in all projects to capture this learning through the generation of project-level 'institutional histories'.

218. The emphasis has also been on 'action research', 'participation' and 'learning by doing', and certainly the participants in all the post-2002 projects reported that they had learned a great deal from the new ways of working associated with coalitions and 'partnerships for innovation'.

219. These institutional lessons range from research institutions in India being able to work more flexibly and in closer proximity to rural people by forming coalitions with NGOs (as in the cases of Orissa, and the grain storage), through to the researchers on sweet potato and maize in Africa working more closely with large- and small-scale traders, as well as producers and processors, and to the teams working on informally vended foods combining strong science with the views and opinions of the traders, environmental health officers and city authorities.

220. Major institutional learning was also reported as a consequence of teams in developing countries becoming managing partners, and sharing the responsibility for the work across a number of diverse organisations.

221. Yet, as suggested earlier, the impact of this institutional change has been limited by the difficulty teams experienced, particularly in Africa, in documenting these changes in such a way that they would be of value to others. Part of the problem may also arise from adopting an 'action research' approach without being clear what this involves in practice. On the one hand, there are NGO projects that engaged in action research in the sense of undertaking their normal activities in a reflective way, in order to understand and improve their own behaviour. On the other hand, there is action research in the sense of activists

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<sup>134</sup> Hall, A J, R V Sulaiman, B Yoganand, R S Raina, N G Clarke and Guru C Naik, Institutional learning and change: towards a capacity-building agenda for research. A review of recent research on post-harvest innovation systems in South Asia, in *Post-Harvest Innovation in Innovation: Reflections on Partnership and Learning*, Box 7, p. 132, NR International, 2003.



wishing to engage as co-researchers with their clients (or the people they wish to influence).

222. Whether or not such projects are ‘research’ will depend on the extent to which there is a conscious process of setting up the projects so that appropriate lessons can be learned and conveying the results in ways *that are likely to be useful to others*. This probably involves devising methods to test a number of different ways of doing things and reflecting upon (researching) what works best. It is clear that this ‘institutional learning’ has not yet been adequately documented effectively, except in India. This is taken up again in the next chapter.

### *Impact on Policy*

223. The RNRRS Evaluation suggests that there has been extensive policy impact from the Programme. “Impact at policy level has been documented in Programmes’ annual reports, Many of the Programmes appear to have engaged successfully, through policy briefs and workshops, with policy makers, and international agencies”<sup>135</sup>.

224. This is certainly true with the CPH Programme, and a wide range of policy impacts were reported. At one level, key informants felt justified in asserting that sweet potato and cassava are now a top priority in the Tanzanian Government’s Zonal Agricultural Policy to achieve food security as a direct result of CPH Programme activities. At another level, the large number of papers from the South Asia Regional Office on new approaches to crop post-harvest research, might be said to have had an important impact, not only in changing the direction of the CPH Programme’s own research, but also on the thinking of elements within the international agricultural research system. It is likely that the CPH Programme has influenced the design and content of the CGIAR programme on Institutional Learning and Change hosted at the International Plant Genetic Research Institute (IPGRI) in Italy<sup>136</sup>.

225. There were also cases in which projects, such as the one on ethical trade in Ghana, which appeared to have little relevance when started, but, following changes to EU import regulation, the results of the research were greatly in demand.

### *Impact in the Form of ‘Good Science’*

226. The innovation approach is sometimes thought to be anti-science. This could not be further from the truth<sup>137</sup>. Mention has already been made of the importance of high-quality science in the sorghum example, in the Diatomaceous Earth project and in the air pollution in India. It is also the case that the CPH Programme has chosen to fund a number of projects where the main output was good science, without the expectation that it would produce poverty-reducing impacts in the short run.

227. Some members of the PAC and a number of academics in both the UK and developing countries take the view that the purpose of DFID funding is to produce ‘international public-good’ science. The review of the PAC states that “much discussion has taken place within the PAC on the preservation of an overview of science issues,

<sup>135</sup> RNRRS Evaluation, paragraph 5.5.13.

<sup>136</sup> It appears that ICRISAT now uses the term ‘coalition’. One senior staff member suggested that the following evolution had occurred: networks originally only involved other scientists; this evolved to “partnerships” working together, but again mainly among researchers, but now they had coalitions which involve “more target groups such as industry”.

<sup>137</sup> Clark, Norman, Science policy and agricultural research in Africa: a capacity building needs assessment, NEPAD’s Office of Science and Technology and the African Ministerial Council for Science and Technology, January 2005, page 13.

particularly as they emerge from an international view of science outputs across the regions ... There was a feeling from PAC members that science issues had become relatively neglected, and that PAC has a particularly advantageous position to advise on these”<sup>138</sup>.

228. In this context, the CPH Programme has continued to fund a very few projects that were specifically funded as a contribution to ‘global public goods’ and were not justified in terms of their short-term impact. An example of this type of work is being undertaken by Dr Beeching at Bath University to identify the full set of genes involved in post-harvest physiological deterioration in cassava<sup>139</sup>. Construction of a cassava genomic library is now said to be almost complete.

229. This is clearly ‘science-push’ research. Dr Beeching suggests that the impact of this work cannot be expected for at least ten years:

1997–2001	2002–2005	2005–2008	2008–2011	2011–2014	2014+
Understanding of the deterioration process and identification of new tools	Development of knowledge and tools	Experimental testing of tools	Field evaluation of experimental plants and refinement of tools	Release to NARs for modification of elite lines and farmers’ preferred varieties	Multiplication and release to farmers

230. The CPH Programme provides many other examples of excellent science. For instance, R7486 developed a rule-based model to predict the numbers of Larger Grain Borer (LGB – *Prostephanus truncatus*) likely to be captured in pheromone traps under any given climatic conditions, so that it could be destroyed (by insecticides or biological control) before it caused damage to maize and cassava stores in Ghana. While the accuracy of predictions was said to be much greater than had originally been expected, there appeared to be no evidence that the system was currently being used anywhere in Ghana.

231. Similarly, the work on aflatoxins in groundnut-based foods and feeds in India (R7809) has apparently reduced the cost of an effective ‘Elisa’ test (now costing about 50 US cents a sample). However, efforts to commercialise the kit “have not yet gone anywhere”. At the time of the visit, a US company had been approached to make the testing kits for about \$5–\$10, but this has so far produced no response. The innovation approach would have suggested that finding partners, who might work alongside the researchers and who had the capacity to commercialise the technology, should have formed part of the original concept and indeed might have been part of the initial ‘coalition’. Yet even more surprising for a ‘demand-led’ research Programme, it appears that there has been no epidemiological work to determine how important the aflatoxins

<sup>138</sup> See Coulter, John and Frank Almond, The CPHP Advisory Committee: a review 1995–2004, p. 11, NR International, July 2004.

<sup>139</sup> The current work seeks to generate knowledge of the full set of genes involved in post-harvest physiological deterioration (PPD) in cassava, the isolation of genetic tools that could be used for the modulation of PPD via biotechnological approaches and the dissemination of these findings to relevant institutions, thereby providing them with the means by which they may control PPD so as to benefit, in the longer term, cassava farmers, processors and consumers through the availability of cassava roots with a longer shelf life.



problems in food and feed are in the Hyderabad area relative to other researchable problems<sup>140</sup>.

232. Professor Geoffrey Campbell-Platt, a member of the CPH Programme Advisory Committee, has recently reviewed the contribution that the CPH Programme has made to science in the area of “Food Safety and Quality Systems”<sup>141</sup>. This draws attention to particularly important scientific work on mycotoxins, their presence and detection in feeds and foods<sup>142</sup>.

233. More generally, the CPH Programme produced a significant number of scientific publications. So far, 236 items have appeared as papers in peer-reviewed journals, book chapters, edited international conference proceedings or bulletins.

<b>Crop Post-Harvest Programme Publications 1997/98 to 2002/2003</b>						
<b>Dissemination Category</b>	<b>1997/1998</b>	<b>1998/1999</b>	<b>1999/2000</b>	<b>2000/2001</b>	<b>2001/2002</b>	<b>2002/2003</b>
(A) Papers in peer-reviewed journals, book chapters, edited international conference proceedings, or bulletins	40	48	29	34	19	<b>66</b>
<i>Source:</i> CPHP Annual report 2003–2004						

### *Capacity Building*

234. The Programme has also produced a range of impacts related to ‘building capacity’. Most projects appear to have been involved in some sort of capacity building, though this was rarely very explicit and indeed there were times in the early years when DFID was said to have looked unfavourably at the use of research funds to build capacity. Even so, seven PhD, 20 MSc and numerous short courses were funded as part of projects. Similarly, many teams reported that the supply of equipment was a particularly valuable part of their collaboration with foreign organisations.

235. Since 2002, support has been provided in the area of helping developing-country institutes to develop the capacity to write funding proposals. In the early phases of the CPH Programme, this was usually the task taken on by the UK research partner. The new coalition approach required substantial inputs by the Programme management team and their consultants to help teams complete the paper work. Many teams reported that training to write funding proposals was one of the most useful activities that they had been involved in.

<sup>140</sup> Personal communication from Dr Farid Waliyar (ICRISAT-IN): “To the best of our knowledge no work was done on epidemiology of aflatoxin poisoning in humans in Andhra Pradesh”.

<sup>141</sup> CPHP, Review of Progress Towards Achieving CPHP Programme Indicators, November 2005

<sup>142</sup> R5898, Development of a second generation biosensor for the detection of Mycotoxins; R6091, Yeast Bioassay for the detection of Mycotoxins; R6127, Rapid methods for the analysis of Mycotoxins and related projects.

*The Question of Commercialisation*

236. Two projects specifically addressed the issue of full commercialisation. In the industrial uses of cassava in Ghana, the project worked with a number of private companies and to some extent underwrote the risks of these companies testing new products. In the case of testing cassava starch in the adhesives used in cardboard box manufacture, the cost of trials could be covered by the project when the production runs were small. However, when the company moved to Tema and purchased high-speed machines, the cost of getting the recipe glue wrong was too expensive for the project to finance. Therefore, the project reported that “we have not resolved the issue of adapting the glue to the faster speed” (a problem of viscosity at the point of ‘cooking’ on the heated roller).

237. A similar constraint arose with the experiments to export sweet potato from Uganda to the UK<sup>143</sup>. The project was not able to meet the importer’s request that they should underwrite the cost of the first trial 40 tonne shipment. They needed \$40,000 to underwrite shipment. They approached both NAADS and the Ministry of Finance to support the shipment, but they were rejected on the grounds that “it was not a priority crop”.

238. Commercialisation of parboiling equipment will similarly require a combination of higher-volume production to reduce costs, retail delivery mechanism, and consumer credit to facilitate the purchase of the technology.

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<sup>143</sup> R8273, Sweet Potato Uganda.



## 7 Lessons for Forming and Operating Coalitions

239. The next five chapters draw out some of the lessons from the experience of the CPH Programme for each of a number of audiences. This chapter focuses on the lessons to be learned about implementing an Innovation Systems approach at the project level. This then leads on to the implications for the funding of research, the management of research Programmes, and for UK research institutions.

240. One of the more surprising conclusions of this review is just how effective the IS approach appears to have been even *at the project level* and even in very hostile research environments. The surprise comes from the fact that the literature takes a national focus in examining innovation systems. It seems that, as the national environment for research deteriorates in developing countries, so projects have to do much more themselves if change is to be successful. However, there is also a growing sense in industrialised countries that the innovation approach has its greatest policy relevance at the sectoral or product level, precisely because the problems are often so sector specific.

### *The Requirements are Substantially Documented*

241. The CPH Programme has spent a considerable amount of effort in developing the details of the ‘Partnerships for Innovation’ approach, and in specifying what would be required from new projects if they were to be transformed from ‘research’ to ‘innovation’.

242. The process has been set out in a number of Guidance Notes and Sheets<sup>144</sup>. These cover the following topics:

- Guidance Note: Livelihood analysis;
- Guidance Note: Gender analysis;
- Guidance Note: Stakeholder analysis;
- Guidance Sheet 1: ‘Partnerships for Innovation’;
- Guidance Sheet 2: The role of the managing partner(s);
- Guidance Sheet 3: Developing a LogFrame;
- Guidance Sheet 4: What DFID means by ‘poverty reduction’;
- Guidance Sheet 5: Risk analysis;
- Guidance Sheet 6: Budgets and financial information.

243. Many of these topics were backed up by face-to-face training sessions with researchers and this was supported by additional documentation<sup>145</sup>.

244. In 2002, the ideas surrounding the ‘Partnerships for Innovation’ approach were new to both Programme management and to researchers<sup>146</sup>. It was clearly intended at the time that there would be considerable ‘learning by doing’, and the Programme managers, particularly at the regional level, took it upon themselves to learn more about the innovation systems in which they operated. It now seems that a considerable amount of

<sup>144</sup> These are available on the web site <http://www.cphp.uk.com/aboutcphp/default.asp?step=4&pid=30>.

<sup>145</sup> For instance, Frank Almond provided training material on CPHP Partnerships for Innovation, a Strategy for 2002–5. This drew on the Tomato Box project in India.

<sup>146</sup> Of course, many of the building blocks of the approach, such as livelihood analysis (much favoured by DFID at the time), gender analysis, stakeholder analysis and Logical Frameworks, had been part of the discourse for many years and were much more familiar to all concerned.

learning has taken place and the current view of what innovation systems are is more sophisticated and more nuanced than it was when the Programme began. Indeed, it is now difficult to distinguish between what was known at the start of the Programme and what in effect are the results of hindsight.

245. Many researchers remarked that the training they received from the CPH Programme after 2002 about the new approach and how to prepare project proposals was the most important and valuable ‘capacity-building’ activity that they had ever been involved with. In part, this was because they felt that they were being treated as adults, in that proposal writing had previously been the prerogative of the expatriates. However, the CPH Programme’s training was not regarded as a universal success, and lessons need to be drawn about the clarity of training material and the choice of effective trainers<sup>147</sup>.

*Variability in Understanding and the Issue of ‘Institutional Incentives’*

246. The results from the field visits provided striking evidence of just how many researchers and CPH Programme staff not only fully grasped the shift in paradigm but were enthusiastic supporters of it. However, there must be an expectation that, in a review of this sort, people would say positive things about the approach, not wishing to bite the hand that feeds them. Even so, a strong impression formed that there was a genuine change of perception. The heads of a number of organisations stated that they felt they would try to adopt this model in their future work. There was particularly strong support for the approach in parts of the system in India, in Ghana at the level of the Food Research Institute and in Uganda at the National Agricultural Research Organisation in Uganda.

247. Inevitably there are people who disagreed with the approach and there were many instances of very different meanings being attached to particular terms. Mention can be made here of the terms ‘partnership’<sup>148</sup> and ‘demand-driven research’<sup>149</sup>, which have so many different meanings as to be almost worthless.

248. For many of the interviewees in East Africa, the new approach was seen only as a new way of doing ‘extension’ rather than necessarily a new way of doing ‘research’. This view probably arose from the fact that the coalition projects in this region (as in the others) were the continuation of previous more ‘research-like’ phases, so some people saw the ‘new approach’ as a better way to get the knowledge from research to users. In the 2004 East African workshop, one team reported that “there were problems of conceptualising the new CPH Programme partnership requirements”<sup>150</sup>.

249. There were also examples, both in developing countries and the UK, of respondents feeling that the new approach was just a new way of describing what they had been doing for years (there was some truth in this). Even within organisations, views varied

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<sup>147</sup> One group of researchers in India described the Log Frame training they received as “very bad”. Similarly, some UK researchers remarked on “the inadequate experience of trainers taken on to explain the process, the impenetrability of the guidance documentation, the lack of feedback and QA procedures within CPHP, and errors in the documentation” (RNRRS Evaluation, Annex 10: Specialists Reports Annex 3 CPHP Comments from Project Leaders, p. 371).

<sup>148</sup> A comment from a recent DFID workshop in Harare was that everyone was in a partnership, but that there was no agreement as to what this meant in practice.

<sup>149</sup> The issues of ‘demand’ have been extensively elaborated in ECPDM 2001, Declaration of Maastricht, 12 October 2001, Demanding innovation: articulating policy for demand-led research and capacity building, an international policy seminar by ECPDM and DGIS Netherlands Ministry of Foreign Affairs and Development Cooperation. It is also dealt with in a discussion note commissioned by DFID from Simon Anderson, Imperial College, Making demand-led research effective and pro-poor (no date, no reference).

<sup>150</sup> Uganda transport, A toolkit for Rural Transport Projects, KENDAT, Kenya, December 2004, p. 32.

considerably. A senior researcher in Uganda said he regards words like ‘coalition’ as buzz words. The RNRRS Evaluation also reported that “very simple concepts such as the value of having truly collaborative projects were presented as new and novel requiring training workshops where the ideas were wrapped up in ‘development speak’ and ‘jargon’”<sup>151</sup>.

250. It seems likely that some participants signed up to the new approach because they felt this was required to get the money, but their research activities were conducted in a traditional way and they failed to contribute to the agreed tasks concerned with institutional learning.

251. Some of these differences no doubt do stem from poor training and documentation, but they are also likely to arise from the very different incentives faced by each stakeholder. Regardless of the merits of the Innovation Systems approach in affecting the lives of poor people, the promotion prospects and sense of personal achievement for many researchers continues to depend on their record of publication in peer-reviewed international journals. This was confirmed in many interviews. Similarly, private-sector participants may feel that it makes little business sense to enter a coalition associated with a market identified by poor people or by researchers. Certainly the move to the new paradigm resulted in many researchers losing control over resources and, in some cases, to an absolute fall in the funds available to them.

252. Despite these concerns, the overall impression from most of the participants is that the CPH Programme has broken new ground, which encouraged traditional research institutes to work effectively, and for the first time, both with the private sector and with NGOs. It seems likely that some of these projects will result in an irreversible improvement in the way that research is conducted in these institutions. It was widely accepted that both the CPH Programme and DFID had significantly “moved the goal posts”. Overall, most interviewees regarded the changes as a positive step in the right direction.

253. Two lessons arise from this: first, that institutional incentives and disincentives are at the heart of any change process and probably need to be addressed directly. A number of respondents said, for instance, that, in India, the agricultural research system suits many of the participants and there is little incentive for change.

254. Second, these various exchanges underline the obligation to improve training and documentation and to state even more clearly what the essence of the innovation process is. The lessons from the CPH Programme suggest that this essence is centrally connected to the continuous interaction between researchers and ‘users of knowledge’ that enables users to know what can be done and researchers to know what is needed. This places a high value on flexibility at the level of project management. The model assumed that users will not initially be able to specify their needs adequately, not least because they do not know what the options are<sup>152</sup>. Similarly, the researchers will not initially know precisely what the users need – not least because they have not interacted with some of the users

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<sup>151</sup> RNRRS Evaluation, Annex 10: Specialists Reports Annex 3 CPHP Comments from Project Leaders, p. 371. The evaluators also remarked: “Interestingly the single overseas respondent felt that the change had been a significant improvement”, p. 373. The implications for UK-based institutions of the changes will be examined further in Chapter 10. NRI has said that “the subsequent problems that NRI staff had with the innovation systems approach adopted by the CPHP were not about the concepts and principles of the approach, but the way that the CPHP chose to implement the approach”, personal communication, A Westby, 3 January 2006.

<sup>152</sup> This has implications for those countries, of which Uganda is one, that are trying to strengthen farmers’ demands (why only farmers’) on the research system – it is probably unrealistic to expect them to do this until they know more clearly what is on offer, and to specify their problems more precisely.

before. Viewed from the perspective of researchers, the essential indicator of the innovation model is that *the nature of the research will change*<sup>153</sup>, through continuous interaction between researchers and other elements of the innovation system including machine makers and retailers, credit institutions etc)<sup>154</sup>.

### *Institutional Learning – the Need to Extract Public-Good Knowledge*

255. It has been commented on earlier that the one area in which the process and methods have not been well documented is institutional learning and the extraction of public-good knowledge. A major finding of the previous chapter was the tendency that the more the projects focused on achieving short-term poverty impact, the less they invested in ‘research’ and the extraction of lessons of use to others both within the country and internationally. However, the review shows that there was a great deal of *potential* ‘public-good knowledge’ present in almost all projects. These knowledge-based public goods concern both the process (how to improve the innovation process) and the content (particularly the science and technology). The problem was that many teams found it difficult to extract these lessons and convert them into generalised lessons of relevance to others.

256. The exception to this tendency is to be found in the CPH Programme’s India portfolio. The team there showed that it is possible to achieve both poverty-reducing innovation and public-good knowledge in the same project. They also showed how it can be done<sup>155</sup>. However, many respondents, particularly in Africa, reported that they felt ill-prepared to undertake this type of lesson-learning analysis and that it was outside their area of expertise. The Programme attempted to address this problem by providing a great deal of support to help teams produce ‘institutional histories’. This has not proved very effective and, in addition, the cost of this task was not always included in project budgets.

257. In this connection, it is interesting to note that the standard approaches to monitoring and evaluation (which all the CPH Programme’s projects were required to adopt) did not generate the basic building blocks of information required for this lesson learning. Nor, indeed, did the monitoring and evaluation (M&E) processes provide the raw material from which indicators of impact might have been drawn, such as the numbers of farmers trained, tonnages of high-quality flour sold, prices achieved by the trained farmers versus those obtained in general etc<sup>156</sup>.

258. A number of respondents felt uncomfortable with the open-ended questions being asked and the lack of clear methodology about how to learn institutional lessons. The CPH Programme insisted that post-2002 projects contained an “institutional hypothesis”, but in retrospect it can be seen that there was not enough guidance as to what this meant and how

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<sup>153</sup> There is evidence of such change within CPHP, most notably in Orissa with the shift from pineapples to tamarind, in the informally vended food projects, which tended to migrate from work on heavy metals to bacteriological contamination. Change of focus can also be seen in the Kenya transport project, which shifted from donkeys and transport to a wider range of issues associated with access to markets.

<sup>154</sup> This issue was raised in the East African workshop document in the following way: “Farmers have complex agendas that are sometimes difficult to disentangle and yet, in most cases, are too broad for projects ... these needs and demands cannot be ignored so as to pursue narrow project objectives”, p. 7.

<sup>155</sup> Andy Hall and others have explored the problems of evaluating whether systems have improved capacities to innovate and when these capacities are pro-poor in: Hall, A J, Rasheed V Sulaiman, N G Clark and B Yoganand, From measuring impact to learning institutional lessons: an innovation systems perspective on improving the management of international agricultural research, *Agricultural Systems*, 78, 2003, pp. 213–241.

<sup>156</sup> Projects did remark that the M&E processes *did* provide useful management information that allowed them to adjust the management of resources as difficulties arose or partners were unable to deliver particular inputs.



to do it. One explanation for this is that the Programme became excessively bogged down in phrases such as “institutional histories” without being clear about what was wanted.

259. A more fundamental concern is the apparent lack of ‘methods’. One authority in this area who has been closely associated with the CPH Programme over the years is Professor Norman Clark. He has recently provided valuable insight into this question in his report to NEPAD where he says:

*understanding the complexity of science policy issues cannot easily be demonstrated from ‘first principles’. There is no ideal template or cookbook set of recipes. In most cases examined what seems to be much more effective is to proceed inductively. Here the use of illustrative case study material has proved to be quite successful*<sup>157</sup>.

260. He is likely to be correct in suggesting that the inductive approach is probably inevitable, but it is far from easy. It is not that there is no method, but that the method is difficult to specify in advance and in a way that would cover every situation. The people who do it well are observing project-level phenomena in relation to their wider experience of the issues in the literature and experience elsewhere. The difficulty of conducting an ‘innovation system diagnosis’, for instance, has been described in the following analogy:

*This process can be seen as being similar to diagnosis of a patient performed by a physician. This analogy suggests the need for holistic diagnosis, and the need for ‘generalists’ before more specialists. While this process can be assisted by a set of procedures, there is likely to be no substitute for the experience and judgement of seasoned and experienced persons on the application of the procedures. In essence common sense suggests that much of this tacit knowledge cannot be codified into a simple set of action points (if it could, there would be no need for physicians)*<sup>158</sup>.

261. There are, of course, people who have attempted to describe the methods of ‘policy analysis’<sup>159</sup>, but these often lack the rigour of the ‘scientific method’ with which many CPH researchers are familiar.

262. The CPH Programme in India has shown what can be done to extract the general institutional lessons from projects<sup>160</sup>. It has produced a body of work that demonstrates how such case studies can be written up, and the considerable influence they can have on the way research is conducted. A project of the CPH Programme in India specifically set out to identify a number of innovation case studies and draw out the institutional

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<sup>157</sup> Clark, Norman, Science policy and agricultural research in Africa: a capacity building needs assessment, NEPAD’s Office of Science and Technology and the African Ministerial Council for Science and Technology, January 2005.

<sup>158</sup> Dr A Rath in Rath, Amitav and Andrew Barnett, Innovations Systems: Concepts, Approaches and Lessons from RNRRS, RNRRS Synthesis Study No 10, The Policy Practice Limited, discussion draft, 23 November 2005.

<sup>159</sup> [http://www.odi.org.uk/RAPID/Publications/Tools\\_handbook.html](http://www.odi.org.uk/RAPID/Publications/Tools_handbook.html).

<sup>160</sup> A review of the Indian case histories does suggest one possible area of improvement. Some of the case histories make quite severe criticisms of particular organisations. It would add even greater insight if the subject of the criticism were allowed a right of reply – either in a footnote or in a very short annex. This is particularly so in some, but not all, of the documents reviewing R7551, the tomato box case study. In this case, an international NGO is severely criticised, and indeed stepped down from the project leadership role. It would have been useful to have their side of the story: see Sustainable retailing of post-harvest technology to the poor: alternative institutional mechanisms for developing and transferring technology, *World Development*, 31(11), p. 1845.

lessons<sup>161</sup>. This resulted in the important and influential book, *Post-Harvest Innovations in Innovation*<sup>162</sup>.

263. Two final points need stressing at this stage. First, it may be believed that ‘action research’ and ‘learning by doing’ do not require any documentation of higher-level generalisations. This view suggests that research institutions will be changed inevitably and permanently by being forced to work in a new way<sup>163</sup>. Certainly personal learning is important, and it is clear that the participants in the CPH Programme’s projects learned a great deal. Yet there is an emerging literature that suggests there is value in using this experience to produce the kinds of ‘evidence’ that is required to change institutional arrangements within and between organisations<sup>164</sup>.

264. The second point is that, although the biggest weakness has been in extracting these institutional lessons, it seems likely that more could have been done to ‘mine’ higher-order lessons about the science and technology of the recent projects and to write them up authoritatively (particularly across projects, and between countries).

265. A number of important lessons follow from this:

- First, if innovation projects, including ‘action research’, are to produce public-good knowledge as well as innovation, they must include elements of a research design that tests different ways of doing things<sup>165</sup>.
- Second, if public-good knowledge is required, it will be necessary to invest resources specifically to learn and extract these lessons. Furthermore, it is likely that skills required to set project-level activities in a wider context of experience and literature will be different from those associated with the implementation of localised innovation.
- Third, ‘learning projects’ will probably require systems to record and extract, throughout the whole project, impact lessons that are different from, and additional to, the M&E systems necessary for effective project management.

#### *Value can be added through Targeted Cross-Project and Cross-Regional Learning*

266. A related concern is that the project approach (and possibly the processes of competitive tendering) appeared to militate against extracting lessons by comparing different projects from a number of different countries. Many projects operated as if they were ‘stand alone’, even if they were conceived as being part of a planned sequence of activities. These ‘higher-level generalisations’ or ‘international public goods’ were few

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<sup>161</sup> R7502, Optimising institutional arrangements for demand driven post-harvest research, delivery, uptake and impact on the livelihoods of the poor through public and private sector partnerships. This was started in 1999.

<sup>162</sup> Hall, A J, B Yoganand, R V Sulaiman and N G Clark, *Post-Harvest Innovations in Innovation: Reflections on Partnership and Learning*, 2003, ISBN 0-9539274-8-2. Another good example of such a history is provided by Prasad, C Shambu, A preliminary note on institutional arrangements for the decentralised grain storage project, CPGP, 2003.

<sup>163</sup> For instance, see Naik, G and R V Sulaiman, Project Final Report for R8310, Institutional learning and change: a capacity development approach to exploring and strengthening post-harvest innovation systems in South Asia, Livelihood Solutions, August 2003–December 2004, p. 26.

<sup>164</sup> The interconnections between research and policy are being explored in the major DFID-funded Rapid Programme at ODI, London.

<sup>165</sup> In addition, if projects are involved in the development and introduction of new machines, then, if they are to adopt an Innovation Systems approach, they must specify the process by which this is to be achieved, even if it is adjusted in the light of new knowledge.

and far between in the recent period of the CPH Programme. However, there may be an opportunity to remedy this under the new DFID research-funding facility.

267. A case in point would be the various attempts to improve the marketing of cassava. Within the CPH Programme, there were at least six different approaches taken to this problem<sup>166</sup>. This would appear to represent an area for substantial added value by comparing and contrasting these experiences and summarising what had been learned<sup>167</sup>.

268. Again this tendency could be countered by setting strategic objectives at the Programme level covering these issues, providing specific funding, and engaging specialist staff to do this (see paragraph 378).

269. There are examples of synthesis being undertaken by the Programme, but they are few and serve to illustrate just how much more could usefully be done. One example of a synthesis is the volume on the *Sweet Potato Post Harvest Assessment Experience of East Africa*. Another is the three-volume text book on *Crop Post Harvest Science and Technology* produced by NRI<sup>168</sup>. However, this latter work does not appear to have been initiated nor funded by the CPH Programme (indeed it does not appear to have received any DFID funding) and does not seem to include any authors from developing countries who collaborated with NRI in their CPH Programme research. Some activities along these lines are now being undertaken and others might usefully follow under future funding programmes<sup>169</sup>.

#### *The Need for Intervention and Additional Transaction Costs*

270. It has been argued earlier in this report that the Innovation Systems approach required a substantially different strategy towards project development. In particular, it needed a greater level of intervention both from the Managing Partner (project leader) and from the Programme managers than had been their practice in the past.

271. Mention has been made already of the need for training, capacity building at the project level and the setting up of coalitions. These issues will be dealt with more fully in Chapter 9 in relation to Programme management. The evidence, however, from the CPH Programme shows that these new processes also mean prospective teams themselves have had to allocate considerable amounts of time to the processes of forming coalitions, to

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<sup>166</sup> R8268, Sustainable uptake of cassava as an industrial commodity; R7497, Commercialisation of cassava processing to enhance rural livelihoods in Eastern and Southern Africa; R8283, Packaging and processing of sweet potato and cassava; R6504, Expanded markets for locally produced cassava flours and starches in Ghana; R7036, An enterprise approach to commodity system improvement: sweet potato in Uganda and Kenya; R7580, Improved cassava chip processing to access urban markets; R7495, Identification of an approach to the commercialisation of cassava fufu processing in West Africa that maximises benefits to sustainable rural livelihoods; R8432, Cassava as an industrial commodity – improving access to knowledge on approaches and options for expanding markets for cassava.

<sup>167</sup> The Regional Office in Ghana has tried to tackle this at a country level, by preparing a monograph entitled: The eleven years of DFID funded post-harvest research in West Africa, draft 2005. This is a useful attempt at synthesis, but could be made more so by both cross-reference to a project index and citation of the key supporting documentation that provides the 'research results'.

<sup>168</sup> *Crop Post-Harvest Science and Technology*, Blackwells, London, 2002, *Volume I* by P Golob, G Farrell and J E Orchard; *Volume II Durables* by R J Hodges and G Farrell; *Volume III Perishables* by D Rees, J E Orchard and G Farrell.

<sup>169</sup> For instance, there was useful experience with informally vended foods in a number of countries. It would appear that there were important common lessons coming out of this work both in terms of the coalition approach and about what worked and what did not. Efforts are now being made to extract these lessons. The conference report on Informally Vended Foods does not (yet) attempt this higher-level synthesis of lessons learned. In Ghana, there has been some effort to link to similar work in the parboiling of rice. Interestingly, there does not seem to have been any attempt to generalise from the various attempts to find commercial uses of cassava nor to extract from the many projects that attempted to introduced small-scale agro-processing machines.

being trained in the new approach, to the specification of the problem through some form of 'systems diagnosis', and to preparing the necessary documentation.

272. Many interviewees described the increased costs to the researchers of obtaining funding for their work, running projects and reporting to NR International. One researcher in India remarked that "the many [project preparation] modules were very time consuming to complete and ... it was difficult to know what they want us to say". Another felt that "the livelihood analysis was a strait-jacket and did not really meet the needs of all the coalitions members". There is even some suggestion that without e-mail it would have been physically impossible to reach agreement between all the parties over the various documents that were required.

273. This additional effort was anticipated by the Programme's managers and a number of steps were taken to minimise these costs to the applicants, including grants being provided to help successful teams develop coalitions and prepare project documentation<sup>170</sup>. It was noted that a number of key coalition partners felt that they were just too busy to participate fully in the process. This was particularly so for the private-sector participants<sup>171</sup>.

274. The question as to whether these costs of additional intervention should be considered as 'overheads' or investment in capacity building will be dealt with in Chapter 8.

#### *The IS Approach and the Identification of New Project Activities*

275. It is important to stress that most of the coalition projects that have been examined were at the later stages of the innovation process. This has meant that some coalition partners see the IS approach as merely a better way of 'doing dissemination'. It is, of course, far more than this. Luckily, the CPH Programme in India provides a number of examples of 'innovation' projects that were started from scratch, and there are lessons that can be learned from this.

276. First, though, it is important to sort out a misunderstanding. There is a tendency to assume that, if the Innovation Systems approach is adopted, then all projects are expected to contain all aspects of the model simultaneously. This tendency is reinforced by the highly stylised diagrams of 'National Systems of Innovation', such as the one in Chapter 4 (which was not used in 2002) or in training material that was used at the time<sup>172</sup>. These provide a static view of the 'system' in which the time dimension has been assumed away. In practice, as the innovation process proceeds through time, some actors will become more involved than others: sometimes it will be the suppliers of new knowledge, sometimes the users, while at others it will be the actors that perform the functions of intermediation. The portfolio of CPH Programme projects exhibits characteristics of different stages in the innovation process.

277. By 2002, many CPH Programme projects had arrived at the stage when they needed to add value to their earlier work by communicating the results more widely. In this sense, there were forces within many projects that propelled them to engage with users of new

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<sup>170</sup> Training was also provided in how to complete the project proposals. Many teams remarked that they found this training specially valuable, as they felt particularly weak when competing for funds internationally.

<sup>171</sup> NRI stated in evidence to the RNRRS Evaluation that it spent £241,000 in 1999–2000 bidding for CPHP work (P371) and implies that this was largely due to the new processes. This underlines the cost of tendering generally and the difficulty of providing a level playing field given that the location of the bid process (either in the UK or in developing countries) considerably affects transaction costs of those involved.

<sup>172</sup> See, for instance, Frank Almond's PowerPoint presentation prepared in March 2002, Partnerships for Innovation: a strategy for 2002–2005.

knowledge and in effect to form coalitions. As one observer in Ghana noted, “the time had come” for these projects to form coalitions<sup>173</sup>.

278. Some of the documentation prepared by the CPH Programme in 2002 suggests that the primary motivation for setting up coalitions was indeed because they represented the best “uptake pathway”<sup>174</sup>. The CPH Programme’s Regional Strategy for East Africa clearly takes this view and justifies the coalition approach partly in these terms:

*The [partnerships for innovation] approach conceptualises the technical innovation process to be embedded in a system of institutional relationships and processes (coalitions). CPHP believes that getting these relationships and processes right in its last three years is the avenue through which it shall achieve sustainable impact. Through carefully designed coalitions, a portfolio of action research projects will be developed and implemented, centring on ‘uptake’ of existing outputs (where ‘uptake’ may involve validation and adaptation/modification of outputs).*

279. Chapter 6 provides a number of examples where the CPH Programme’s research is ‘supply-driven’, but on occasion this is a necessary part of the innovation process, particularly where there is a need for work that sets the agenda, either by exploring the extent of a problem (such as heavy metal contamination in India), or opening up a way of thinking about a problem (the development of theory, or developing a set of basic tools or methods, such as the DNA sequencing). This only becomes a problem when it is undertaken to the exclusion of other work, and when the objective is short-term poverty impact.

280. In terms of insights as to how the IS approach can be applied to new project areas, the India projects have tested a number of approaches. In most recent ‘field’ projects, this has involved picking an institution, or even an individual, that can be trusted both to understand what is required of the coalition approach, and to implement it effectively. In these cases, they commissioned what was in effect a ‘project champion’ associated with an ‘intermediate organisation’ namely IDE or an ex-IDE employee. They undertook a ‘system diagnosis’, which included both the livelihood analysis and stakeholder analysis insisted upon by NR International. They also undertook an additional analysis on marketing, since this was regarded as essential, even though it was not required in the NR International methodology. In these cases, they first selected areas in which they knew (and already trusted) some of the potential partners. Then they worked with the partners to identify the problem. This was in contrast to most traditional projects, which start with the ‘research problem’.

281. Such a suggestion is clearly not without problems. Not least, it raises the important issue of whether all the partners required in coalition need to be involved from the outset. Innovation system theory suggests that ‘problem definition’ requires people outside the research system to be fundamentally involved. Certainly one of the indicators of genuine ‘partnership’ in research is the extent to which the partners are involved in all aspects of project development, including the allocation of the budget.

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<sup>173</sup> However, if the time was right it was not inevitable. Many other DFID-funded research programmes also recognised the need to add value to past research, but appeared to take what might be labelled a ‘communications’ approach to the problem.

<sup>174</sup> This point was made by Dr Emily Twinamasiko, NARO in Uganda.



282. The Indian cases provide examples where the project champion was committed to, and fully understood, the innovation approach. In such cases, it probably does not matter who is involved at the outset, as an objective of the ‘intermediation’ activity is to consult and draw in the key players. However, where projects and their initiators or champions are unfamiliar with, or uncommitted to, the approach, the CPH Programme’s insistence on a stakeholder analysis is an essential first step. Just how complicated this process can be in practice will be explored in the next section.

283. In India, the Regional Office appears rightly to have been given considerable latitude by NR International in how it identified and developed projects. For instance, in a number of these projects, the documentation apparently did not list the names of the project partners in advance (that is, at the project proposal stage) and, in some other cases, even the ‘problem’ was not specified. One project at least (R7551 related to tomato boxes) was initially rejected by the PAC on the grounds that it did not specify the “technical constraint”.

284. This part of the Indian experience suggests two key lessons: first, that, with projects that do not build on existing research networks, project selection criteria will necessarily have to be sophisticated and flexible and may well depend on the extent to which the project promoter can be trusted, rather than on any formula about collaborating partners.

285. Second, that a systems approach in general, and a ‘system diagnosis’ in particular, are crucial. The system diagnosis can be simple or complex (adopting different ‘fractal levels’ of analysis depending on the resources available and how wide the problem boundaries are set). It essentially requires: a vision of the strengths and weaknesses of the system involved in effective innovation; the involvement of a wide range of key players; and a mechanism to allow the diagnosis to evolve as more experience is gained and as the operating environment changes.

### *Don’t Contract Partners too Early*

286. All the CPH Programme coalition project teams were required to undertake stakeholder analyses before they created a coalition. The review of this experience provides valuable insights into the process and the difficulties of selecting these coalition partners.

287. A number of interviewees concurred with the view of an African researcher who warned project developers “not to jump into bed” with partners too early. This adds weight to the need to distinguish between potential coalition partners and stakeholders. The same African researcher also suggested that you “don’t want a marriage certificate with all the people you drink with”. DFID makes the same point in its most recent request for expressions of interest in its research consortia<sup>175</sup>.

288. The CPH Programme web site includes in its definition of the coalition approach to project management the idea of “joint ownership” and the idea that the “project design and implementation team is drawn from key stakeholders (we call them ‘core partners’)”. Many of the partners in developing countries said during interview that they felt this was a

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<sup>175</sup> “It is vital that the proposed consortium is feasible: it should not be overly ambitious relative to available resources. Consortium partners are major contributors to the RPC but they are unlikely to include all organisations with which the RPC is likely to collaborate or consult during its life”: DFID call for Expression of Interest, September 2004, paragraph 7.

crucial step in shifting to the new paradigm, as they felt (rightly or wrongly) that they had often been excluded from these key processes in previous research projects.

289. However, the CPH Programme's requirement was that project proposers had to specify the names of coalition partners in the proposal document. This made sense in those coalition projects that were essentially continuations of previous work. In these cases, the partners were already known to each other, and had built up a certain amount of trust. Nevertheless, as suggested in the previous section, where coalitions have to be built from scratch, projects may need the flexibility to identify potential partners and to build trust with them during the early stages of the project before entering into a contractual relationship.

290. The portfolio inevitably provides examples of project managing partners now believing that they would have been better off with other partners, either because the ones that were chosen were not pulling their weight, or certain critical inputs could not be provided by existing partners. Projects reported particular difficulties in finding private-sector partners<sup>176</sup>.

291. Uganda provided examples of projects involving what turned out to be the wrong partners. Some partners were not able to carry out some of the tasks assigned to them. Part of the problem probably arose from partners being involved on a very part-time basis. Such tasks had to be transferred to others in very difficult circumstances – though it is a tribute to the coalitions that they managed this. This probably suggests that mechanisms for such transfer of funds should be agreed by partners at the outset.

292. One key player in the East African scene, who has reflected on the role of coalitions, even goes as far as to suggest that coalitions may take as long as two years to develop<sup>177</sup>. If this view were widespread, it would provide important lessons for future project design.

### *Characterising of Successful Coalitions*

293. Early CPH Programme documentation made the distinction between the “two strands” of the 2002 strategy: first, there was the coalition approach to project management, which involved joint ownership, flexibility and “institutional learning”; and second, there was the Innovation Systems Research, which was to look into the institutional and organisational context within which Post-Harvest Research takes place, which regarded projects as case studies, and aimed to produce policy recommendations<sup>178</sup>.

294. The Partnerships for Innovation approach was described, therefore, as having both internal and external characteristics. Internally, coalition projects were said to represent a better way of managing projects, by providing wider ownership among the partners. While externally, coalitions were thought to provide a better way of engaging with stakeholders. Clearly under this characterisation of coalitions, partners did not have to be the same as coalition stakeholders.

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<sup>176</sup> In the tomato box project in India, IDE now feel that they should have introduced the private sector sooner, in fact it took 18 months. In the Uganda Sweet Potato project, it took a long time to find an appropriate private-sector partner too.

<sup>177</sup> This point was made by Dr Emily Twinamasiko, of NARO in Uganda. See her PowerPoint presentation to the CPHP workshop in Kampala, Reflection and Lesson Learning on Partnerships for Innovation, 17–18 February 2004, Kampala, Uganda

<sup>178</sup> See Frank Almond, PowerPoint presentation, footnote number 172.



295. Looking at the whole portfolio, the *successful* CPH Programme innovation projects might be said to fall into four categories:

Characteristic	Typical Example
Demand-led	The Fruits of the Nile Project in Uganda (R5539(CB))
Intermediary- led	The Indian 'field' projects facilitated by IDE (R7551)
'Natural' coalitions	The Industrial uses of Cassava, Ghana (R8268)
'Induced' coalitions	Sorghum Poultry Feed in India (R8267)

296. A number of the projects achieved innovation because they had a strong demand from a manufacturer or formed 'natural coalitions' because of the system characteristics of the task being undertaken<sup>179</sup>. However, the interesting feature of the CPH Programme portfolio is that there were also successful innovations where either an intermediary was able to form the link between suppliers of new knowledge and users of new knowledge, or the participants were induced to work in coalitions with others because they understood that their only chance of obtaining grant funds was by joining the coalition (or were persuaded by the project catalysts). Some of these latter participants seem to have gone on to learn that such arrangements are beneficial to them. This suggests that the proactive approach can be, and has been, successful.

297. The essence of the coalition, indeed the reason why the term coalition is used at all, is that various actors, with differing goals and objectives, see their individual interests (the balance of incentives) being met by combining in joint actions with other actors<sup>180</sup>. They come together for as long as they believe their best interest is being served. Sometimes this may be short lived – until the task is performed – or it may be long-standing, as their goal is likely to be achieved most effectively by working with the same actors over many years.

298. What is interesting is that some of the coalitions are likely to continue even after the incentive provided by CPH Programme funds comes to end. They clearly see the value of working together outweighing the transaction and other costs. In Uganda, the sweet potato coalition project has evolved into the legally constituted Uganda Sweet Potato Development Association<sup>181</sup>. In Ghana it, was suggested that, as a consequence of lessons learned from CPH Programme coalitions, The Ministry of Food and Agriculture had created a "Soya Bean committee". This was described as utilising many of the characteristics of a coalition approach, as it apparently involves all the key players in a coalition that agrees how to harmonise the needs of the buyers with those of the producers.

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<sup>179</sup> See paragraph 48 above.

<sup>180</sup> There are strong 'natural' incentives for research institutes not to form coalitions, the principal reason being that in coalitions they are required to 'give away' funds that they could otherwise have spent on their own staff and facilities. The incentives to form coalitions may be (a) that they may not win the bid without certain types of partner, (b) certain types of output will not be achieved without coalition partners.

<sup>181</sup> See their web site: [www.sweetpotatocoalition.org](http://www.sweetpotatocoalition.org).

*The Range of Coalition Partners is more Important than the Number*

299. The CPH Programme portfolio demonstrates that the nature and number of coalition partners varies considerably across the coalition projects. Two types of problem arose from which lessons can be learned. First, some projects saw the issue as merely increasing the number of partners and just added more research institutes. Second, some projects added so many partners that the coalition became difficult to manage.

300. In most cases, the addition of more research institutes was probably part of an essential learning process as research institutes began to understand what was required. In a number of projects, the range of partners did increase as the projects evolved from phase to phase. This again re-enforces the need for project leaders to have a clear understanding of the innovation process in which they operate before deciding which partners are likely to be necessary for effective innovation.

301. The portfolio suggests that, in addition to the more obvious partners, such as the private sector, farmers, processors and traders, NGOs seem to have played a particularly important role in CPH Programme coalitions. Particularly valuable has been their role in enabling the formal research institutes to break free from their more restrictive administrative controls and to provide better two-way communication with farmers' groups and small-scale processors. NGOs were found to be able to procure equipment and release funds for travel and subsistence far more quickly than government organisations in the countries visited. Nevertheless, the portfolio also contains examples of the transient nature of many NGOs. They were strong and powerful at one moment, and wracked by weak financial control or indeed corruption on others (paragraph 152). So, while NGOs provide valuable inputs in the short run they may well not provide a long-term solution to reforming national research systems.

302. The problem of having unmanageable numbers of partners in coalitions seems to have arisen in part from the tendency to take the line of least resistance and divide the funds equally among all the participants at the planning meetings. One interviewee mentioned that "all stakeholders expect a hand out".

303. Some project coalitions found it difficult to decide which partners should be in the coalition and receive funding from the project, and which would merely be dealt with as stakeholders. There are cases in the portfolio of private-sector participants who can be regarded as key coalition members that in fact did not receive any funds from the project. This again suggests a more nuanced interpretation of the categories of actor involved in coalitions, ranging from participants with contracts, through to passive stakeholders who are merely affected by the project outcome whether or not they participate.

304. It also suggests that Programme management needs to find ways of 'protecting' Regional Office staff from the consequences of the difficult decisions that inevitably arise in the allocation of funds between competing stakeholders.

305. Others solved the problem of selection by setting up criteria that would give legitimacy to excluding many potential bidders. In Ghana, it seems a choice was made in 2002 to concentrate most future funding on activities in the northern region. This may well have been a good pragmatic choice that would allow a concentration of effort in an area that was particularly poverty stricken. Even so, all proposals were approved by the independent Programme Advisory Committee.

306. Perhaps the most useful lesson in this respect was that project partners were encouraged to work ‘outwards’, first by defining the tasks, then by deciding which partners were most appropriate to undertake the tasks (trying to define their ‘comparative advantage’) and only then deciding on the allocation of the money in terms of the costs of performing the necessary tasks. This did not work in every case, but it certainly resulted in changes in project management (where the partners felt that someone other than the project initiator would be most appropriate to run the project) and helped add some rationality to the division of the funds (when some partners cost so much more than others and an equal division of the budget would not have been satisfactory).

#### *Establish Mechanisms for Conflict Resolution*

307. Coalitions are temporary agreements for organisations to work together. Necessarily, there are differences in the objectives pursued by each partner. For instance, the director of an early attempt at a coalition in India described how each party had different objectives: “the CEC [the NGO] wants ‘products’ while others wanted ‘research’”. Initially, CEC was said to have felt diffident about the research issues and the director now believes that “the research element should have been built more effectively into the project ... I was not confident in [this area of] leadership”.

308. The CPH Programme’s projects showed that there were other sources of conflict. Many of these arose about whether or not particular partners had delivered what they had promised and whether any failure was as a result of circumstances beyond their control. Other coalitions talked of the different cultures between researchers and the private sector. One private-sector partner in Uganda said that “coalition meetings were not business-like and took far too much time – meeting all day and still not making decisions!”. Another said that “too many meetings waste time and this means I am losing money”. The researcher countered that “I am a researcher and I have to do these things”.

309. Only one project addressed the issue directly by creating a formal conflict-resolution procedure. This project, on the sustainable uptake of cassava as an industrial commodity (R8268), agreed in advance that, if the parties involved are unable to resolve a conflict themselves, it had to go to arbitration. The partners created a three-person arbitration committee that operated according to a pre-established set of rules. The cost of this system was met out of each partners’ budget. When a conflict did arise, a rather different process had to be invoked, as one of the parties in the conflict was a member of the arbitration committee.

310. It was a measure of the robustness of the CPH Programme’s coalitions that they were able to resolve conflicts amicably. In one case, the conflict arose over disputes about jurisdiction between two regulatory authorities. The key innovation system lesson here was that, had both these parties not been part of the same coalition and built up mutual trust, there would have been no process to resolve the conflict and the project would have failed from what is often described as a lack of political will. Similarly, it is to the considerable credit of the coalitions that they were able to take funds away from partners that were not able to deliver.

#### *Don’t Spread the Funds too Thinly*

311. An obvious danger of the coalition approach is that the level of funding that used to be given to a single research institute is now spread across a larger number of partners, with the risk that they all received sub-optimal funding levels. While it is difficult to generalise, there is *prima facie* evidence that coalition projects are likely to need more funds and therefore there should be a smaller number of larger projects.

312. In the case of the first round of CPH coalition projects, this problem was exacerbated because it was decided that each coalition project should be relatively small. This was for a number of reasons: to ensure that many project clusters could have funds to add value to previous research; to spread the risk across a number of projects, as the approach was novel; and because the projects would be inherently smaller, as most of the managing partners were likely to be in developing countries and would have lower costs.

313. Many projects ascribed the problems they had to the lack of funds and to the fact that too many partners were only able to contribute to the projects on a part-time basis.

314. For this reason (and others, such as system capacity building, and the need to achieve a critical mass of effort over a long enough period), the lesson here is that, if an Innovation Systems approach is to be adopted, this will require a smaller number of larger projects. The advantages of programme funding are discussed in paragraph 371.

#### *Establish Real 'Ownership'*

315. The question of ownership was raised in a number of interviews. While most respondents felt that the creation of coalitions meant everyone had responsibility for the work, a few felt that the process actually resulted in nobody taking responsibility. This was said to be especially so if there were a large number of partners, for whom the project represented a tiny amount of their workload. It is believed that this problem could be exacerbated by 'basket funding', where neither the donor nor the recipient knows whose money is used for any particular activity.

316. The portfolio also contained examples where particular project partners overly dominated the coalition. These examples are drawn mainly from the early attempts at coalitions prior to 2002, and involve the impression that either a particular institution was more prestigious than another or that a particular discipline was more important than others.

#### *Funding the Management of Coalitions*

317. The main lesson in this regard from the current batch of coalition projects is the very large amount of effort that is required by the managing partner. In some cases, particularly where the managing partner is an NGO or a consulting firm, the costs of these efforts are paid by the project. However, there are cases, such as in Tanzania, where government regulations limit such payments and this has caused difficulties for the managing partner as it took them away from other work.

318. A related concern, mentioned by many of the projects that were managed by partners in developing countries, was how to cover the costs of the cash flow. These problems are said to arise because DFID provides funds to its RNRRS Programmes in arrears. Contractors such as NR International then cascade this condition in their contracts for the CPH Programme's projects. One of the great advantages of working with UK institutions is that they are able to carry the cash flow of the projects in which they are the managing partners. Many donors, such as the Canadian International Development Research Center (IDRC) avoid this issue by paying a proportion of their grants in advance. DFID will need to consider this issue if it wishes to support more in-country institutions in the future.

#### *A Summary of the Lessons Learned at the level of Projects:*

319. Among the key lessons that were mentioned by the current managing partners were:

- The need to take specific actions to build coalitions – they do not happen 'naturally';

- The need to specify the tasks, then cost them, and then divide up the funding cake;
- The importance of getting both the right organisations and the right people within the organisation in the coalition (in order to get the right mix of representation, skills, continuity, trust and chemistry);
- The need to work at keeping weaker but essential partners in the coalition, and helping them to come up to speed – a necessary component of capacity building (who/how to pay?);
- The value of formal conflict-resolution mechanisms with procedures agreed before conflicts arise;
- Importance of clear criteria for including and excluding partners (this appeared to arise from the threat of legal action on the part of excluded players);
- Importance of clear responsibilities, milestones, and performance criteria (so that sanctions can be applied for non-performance – such as exclusion and non-payment);
- Need for leadership by managing partners in the form of a ‘mild autocracy’ rather than majority opinions;
- Importance of pre-financing and cash flow;
- The importance of improving proposal- and report-writing skills;
- The important roles for expatriates (this is discussed further in Chapter 10);
- ‘Successful coalitions’ do not necessarily result in innovation – many projects now face difficult next steps.

## 8 Lessons for Funding Research

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320. The previous chapter drew out a number of lessons from the CPH Programme's experience at the project level. Many of these lessons have implications for the way that DFID and other donors can improve the impact of their research funding. These include: a more hands-on approach to project development; the need to invest in the extraction of public-good knowledge; the approach to project identification and the development of project teams; and the need to locate projects in the wider national context. These are explored in this chapter.

321. In Chapter 3, a number of trends were identified that provide the context in which DFID will provide its future support to research. The main lesson from this would appear to be that DFID will have much less capacity in future to engage with, and learn from, the research it funds. The drivers of these changes seem to be downward pressure on DFID staff numbers, a desire to provide budgetary assistance rather than project and technical support, and a desire to delegate responsibility and resources to staff at the country level. Added to this is the long-standing requirement to have a direct impact on poverty reduction. Recently, this has been tempered by recognition of the importance of investing in infrastructure, widely defined to include research and skilled human resources. Equally important, investments in infrastructure (including research) are in turn to be based on international competitive tendering rather than being tied to UK suppliers.

322. In relation to research, the RNRRS Evaluation poses one inescapable conclusion: that there is a range of possible objectives for DFID's investment in research, but only DFID can decide what it wants in terms of generic knowledge, adaptive research or capacity building<sup>182</sup>. Equally, the changes within DFID determine what it is capable of doing. Certainly the options facing DFID Central Research Department are severely constrained by the lack of staff, weakening links to Policy Department, and the rules and procedures restricting interactions between headquarters and country Programmes. There is a growing perception of a curious paradox: as DFID's language relating to research, partnerships, ownership, and poverty has become more sophisticated, its actions have become more simplistic<sup>183</sup>.

323. However, it does appear that DFID wants poverty impact *and* public-good knowledge from its research: "walk[ing] the tightrope between scientific knowledge generation and livelihoods impact"<sup>184</sup>. If this is the case, then this review of the CPH Programme's activities provides a number of lessons about how to do it:

- The Innovation Systems approach provides a framework for actions that range from the simple to the most complex;
- The CPH Programme 'Partnerships for Innovation' approach provides practical examples and advice about how to do it and what the pitfalls are likely to be.

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<sup>182</sup> These options are presented in more detail in Section 7.7 of the LTS RNRRS Evaluation.

<sup>183</sup> Dr Amitav Rath reports that this view was expressed in different ways by a number of RNRRS Programme Managers during the recent RNRRS Innovation Synthesis Study, 2005.

<sup>184</sup> RNRRS Evaluation, p. 71.



*Is the IS Approach Relevant to all Problems and Sectors?*

324. It might be argued that the Innovation Systems approach is particularly applicable to narrowly defined crop post-harvest systems, particularly those associated with equipment for storing and processing crops. Yet the CPH Programme showed that the Innovation Systems approach not only could be applied to equipment-based projects, but also was effective in the introduction of new ways of doing things, and in achieving policy change. In each of these cases, the IS approach provided insights about priority setting and the range of actions that are likely to be required. The key insight is that a whole-system perspective is required and that a wider range of actors and experience needs to be involved.

325. However, as has been repeatedly stressed, the innovation process proceeds through time. This means that there is also a need for ‘science–push’ at certain times. The CPH Programme’s ‘science–push’ projects were probably at their most useful when they were agenda-setting activities that used advanced science to demonstrate to policy makers and others the importance of issues that they may not have thought about.

326. It has also been suggested that one important type of ‘science–push’ research involves the search for ‘vaccines’. This may be said to represent the ‘ideal type’ of research to which DFID’s centrally funding aspires<sup>185</sup>. Such research might be considered closest to the ideal of international public-good research (where the private sector is said to be unwilling to invest in research related to diseases that largely afflict people who are unable to pay for its prevention), and has the potential for major global impact. There is certainly a need for this type of research and Chapter 6 has provided a number of other examples of ‘good science’ within the CPH Programme that may be thought to have some of the characteristics of investment in vaccines: that is, they required heavy investments in the types of advanced science and technology in which the UK and other OECD countries have a comparative advantage.

327. It should be noted that, in the language of National Systems of Innovation, research on vaccines may be attractive to donors because much of the system is outside developing countries, and many of the mechanisms required for its successful innovation are assumed to be already in place, including its manufacture, testing and (aid-funded) distribution. The weakest part of the vaccine innovation system is likely to be the ‘last mile’ of the supply chain, particularly in its delivery to the poorest people in the remotest areas. However, the lesson here is that very few areas of research that have an impact on poor people are likely to be of this type. A danger therefore arises when what might be called the ‘vaccine model’ is unthinkingly applied to other quite different problems, where the innovation system is far less developed.

328. Perhaps the strongest argument for the widespread applicability of the IS approach is the recognition that the many of the elements of the traditional linear agricultural research system are not (and probably never were) in place, particularly in the form of effective extension systems. It is now widely accepted, for instance, that only a small proportion of new seed varieties are actually used by farmers. DFID itself reports that “there are some areas where we do have answers, but these answers have not yet reached the poor. Most Kenyan farmers still use seed varieties that are 20 years old” (Research Framework, paragraph 120).

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<sup>185</sup> Research Framework, paragraph 29 and elsewhere.



329. As suggested at the outset, this problem has been compounded in recent years by the progressive withdrawal of many elements of DFID's own innovation system. At the time that RNRRS started, it was assumed that DFID itself would be the major implementer of new knowledge generated by DFID-funded research (see paragraphs 26 and 96).

330. So it can be concluded that both theory and experience from the CPH Programme suggest that the IS approach does indeed have wide applicability to a range of activities with which DFID may wish to be involved through its investment in research. The various types of new knowledge and the extent of interaction with the wider innovation system can be summarised in the following typology:

Types of knowledge	Extent of interaction with the rest of the innovation system
Paradigm Shifting	Einstein working on his own <sup>186</sup> : little interaction with National Systems of Innovation, but intellectually located deep within the body of scientific knowledge
Agenda Setting	Researchers necessarily 'ahead' of the users but clearly must be closely in touch with both current theory and practice, and with actual and potential audiences (users)
Policy Changing	Strong frequent interaction between understanding the needs of policy makers (public, private and civil society) and the generators of new ideas
Changing Practices, Procedures and Services	Strong frequent interaction between understanding the needs of administrators and implementers (public, private and civil society) and the generators of new ideas
Introducing 'New' Commodities, such as:	
vaccines	Strongly supply-driven science, but with substantial parts of the innovation system already in place
new plant varieties	Well-known system for plant breeding, replication and distribution; probably deteriorating in some areas and changing rapidly in others through increasing private-sector involvement and changes in technology (biotech)
machines	The quintessential case for strong and continuous interaction among networks of suppliers of new knowledge, manufacturers, retailers, intermediaries and customers for the final products or services

### *Does Research have a Role in Fragile States?*

331. Doubts have recently been expressed about the value of research in 'fragile states' because of the lack of 'complementary conditions',<sup>187</sup>. The IS approach predicts that this will be so. Perhaps more interesting is that even the most cursory innovation system diagnosis would indicate where investments were likely to provide the greatest return,

<sup>186</sup> In a single year – 1905, a year that would become known as Einstein's miracle year – he published papers that would redefine how we see our world and universe. One was: On the electrodynamics of moving bodies. It contained his Theory of Special Relativity. From this paper would come an additional three pages, finished in September of the same year, that would contain the derivation of  $E=mc^2$ , the most famous mathematical equation ever written. In 1921, Einstein was awarded the Nobel Prize, not for his theories of relativity, but for another paper published in 1905. In this paper, he proposed that light was not simply made up of waves, it could also be thought of as discrete, individual particles or quanta. Ten years after his Theory of Special Relativity, he published his Theory of General Relativity – a piece of work widely acknowledged as his masterpiece. Excerpts from BBC web site: [http://www.bbc.co.uk/sn/tvradio/programmes/horizon/einstein\\_symphony\\_prog\\_summary.shtml](http://www.bbc.co.uk/sn/tvradio/programmes/horizon/einstein_symphony_prog_summary.shtml).

<sup>187</sup> Rates of return to research: a literature review and critique, draft paper commissioned by DFID (DFID web site, November 2005).

either in terms of innovation or of enabling fragile states to begin the long process of harnessing existing knowledge in their development process. It is likely that investment in a country's innovation system is a necessary condition for development – though the most valuable investment may well not be narrowly defined 'research'<sup>188</sup>.

### *The Need to use a Wider Range of Aid Instruments*

332. The issue of fragile states is a subset of the large issue of deteriorating infrastructure. Chapter 5 provided a brief insight into the inadequate and probably deteriorating National Systems of Innovation in a number of states that are not necessarily fragile. That chapter concluded that, in such countries, a wider range of instruments may be more effective in producing beneficial change in the innovation system than individual, narrowly defined research projects. It was suggested that many of the instruments DFID uses to achieve 'good governance' reforms in other sectors might well be more appropriate. In particular, the 'institutional incentives' that drive or inhibit institutional change that were observed in many of the CPH Programme's coalitions may well represent a major area for intervention and reform.

333. Such attempts to induce institutional change at a level higher than that of projects would appear to have considerable promise both in countries such as India, which have huge scientific and technological resources tied up in unproductive institutional arrangements, and in countries with less developed technological capacity (paragraph 124). The lesson to be learned from the IS approach is that there are many possible areas for intervention within the system, but that the allocation of all 'research resources' needs to be guided by a vision of the strengths and weaknesses of the system rather than by a predetermined notion of a narrowly defined research project.

334. DFID endorses this view, but suggests that their Central Research Department can do little to deal with it. Their Research Framework states:

*Yet where research capacity is weak, the main causes are not in fact specific to research. Rather, they affect the whole public sector: unreliable finance, poorly paid and managed staff, weak and unreliable infrastructure, sometimes a lack of security. Tackling these issues is central to DFID's wider work in such countries. DFID has moved away from funding standalone projects to working directly with governments and civil society to change these underlying problems. This will have the greatest impact on improving research in the long run, by maximising the prospect of creating capable and effective public institutions, which can make a sustained contribution over the long term. (DFID Research Framework, paragraph 46).*

335. An Innovation Systems approach to research funding would mean DFID shifting resources away from 'research projects' towards strengthening the weakest links in the systems that use new knowledge. The CPH Programme demonstrates (though has not necessarily evaluated) a range of possible instruments, in addition to formal 'research projects', by which innovation systems (and therefore poverty impact) can be improved. At the project level, they mainly involve encouraging the various actors to change their practices by participating in 'learning by doing' action-research projects, or by investing in

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<sup>188</sup> In particular, it appears that one of the major outputs of 'research' programmes is the development of trained people.

strengthening capacities through training<sup>189</sup>. They also include initiatives, such as those recently in India, directly at the policy level.

336. The importance of investing in capacity development has run through many of the conclusions of this study. DFID rules and procedures have made this difficult in the past, but do now seem to be changing. Interviewees in Africa clearly felt there was no alternative but to build capacities at the national level, not least as these are the elements of the system that need to absorb and implement new knowledge even if this knowledge were generated regionally or already existed internationally.

#### *Mechanisms to increase the demand for new knowledge*

337. There are, however, an even wider range of policy instruments available to bilateral and other donors. DFID's new Research Framework rightly draws attention to the need to increase the 'demand' for new knowledge, rather than concentrate, as in the past, on increasing the supply<sup>190</sup>. CPH research either identified or demonstrated some interesting possibilities for using 'research funds' to increase demand, shifting control over resources to actual or potential users of new knowledge (see paragraphs 74 and 184). Changing these power relations appears to be fundamental to successful innovation.

338. These projects lead to the speculation about how other projects in the CPH Programme might have evolved if the funds had been given to other potential members of a coalition, such as the manufacturers of rice parboilers in Ghana, the villagers in Ghana who wanted to explore transport alternatives, or even the cardboard box manufacturers looking for cheaper sources of starch for their adhesives<sup>191</sup>.

339. Such novel arrangements also suggest opportunities for public-private partnerships. The CPH Programme provides a number of examples of such partnerships in both manufacturing and processing. It has also funded research relating to the nature and form of private-sector regulation, in the setting of standards, in creating transparency and 'levelling the playing field'. The CPH Programme has supported such work, for instance, in relation to EU regulations governing the export of crops to the EU<sup>192</sup>.

#### *The Need for Intervention*

340. One of the major lessons from the CPH Programme's experience is the need for a more hands-on approach to project development. The implementation of the IS approach required interventions to help teams in developing countries to prepare project documentation, to develop and implement innovation projects. The previous chapter showed in particular that project participants were not able to understand and apply these processes on the basis of written instructions and guidance. They required assistance and face-to-face discussion.

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<sup>189</sup> An example of an action research project with the explicit objective to change the behaviour of a research institute by encouraging them to learn from the experience of working with an NGO is provided by the Tropical Forest Research Institute (TFRI), which has not previously worked with an NGO that is in close touch with the target population. See R8262, Developing a coalition approach to non timber forest produce for better livelihoods of tribal communities of Madhya Pradesh, India.

<sup>190</sup> DFID Research Framework, item 52iv.

<sup>191</sup> Direct subsidies to the private sector would have to be dealt with using a certain amount of ingenuity and care, not least to ensure that the results were placed in the public domain and so as not to provide any one company with an unfair advantage. Vouchers for research that were tied to a specific knowledge supplier have been suggested as one possible alternative.

<sup>192</sup> R7528 in Zimbabwe, R8271 in Zambia, R6611 in Uganda, R7168 in Ghana. In some of these cases, the work was carried out before the private sector knew that such regulations were important to its activity – this was particularly so in the case of Ghana.

341. This mirrors the experience of IDRC in Canada, which is considered by some people to exhibit best practice in financing research. According to DFID's Surr Report, IDRC spent 18% of its budget on what it calls "operational activities" (mainly technical assistance to researchers) and a further 22% on overheads and more tightly defined administrative costs<sup>193</sup>.

342. The CPH Programme's experience suggests that this may well represent best practice. If DFID is unable or unwilling to perform this task itself through its country offices, this leads to only one conclusion: the creation and funding of some form of regional or country representation. The CPH Programme has experience of establishing such representation through its four Regional Offices. As the Programme shifted towards the innovation approach, the staff of these Offices were seen to be increasingly necessary to bring Programme management nearer to the researchers, to provide day-to-day management of the local Programme and to provide technical assistance at the project level.

343. The regional focus of the SRSA provides important support for such a local presence. However strong the original arguments were for exploiting the economies of scale in administration by forming Programmes in the RNRRS, it seems likely that such economies are even greater at the country level, suggesting that there would be considerable advantages in a single in-country office<sup>194</sup>.

344. DFID will clearly face a considerable challenge in the next phase of research funding, whether to build on local institutions within developing countries to improve innovation or to set up parallel systems (such as using CPH Programme-like Regional Offices) in each developing country or run the whole operation from a UK base. If the parallel option is chosen, an objective of DFID's investment could be the creation of adequately functioning local innovation systems in developing countries at the end of ten years. This probably requires the development of joint partnerships based on local institutions supported by one or more external partners.

### *Separating Research Fund Management from Project Execution*

345. A related question is whether to continue the separation of the management of research from doing research. The CPH Programme provides valuable evidence about the advantages and disadvantages of separating the administration of the Programme from the execution of projects. DFID currently appears to favour the so-called Development Research Centre (DRC) model, in which there is no separation, as the prime contractor is likely to be a research institute, that is, a knowledge supplier rather than a research user or indeed a national research organisation.

346. There are good arguments both for and against separation. From the point of view of innovation theory, whatever arrangement is chosen, it should have the facility to fund organisations other than research institutes (e.g. users of new knowledge or intermediary organisations) and ideally should be allowed to strengthen any element of the innovation system within a country. DFID's recent DRC arrangements do not necessarily imply that

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<sup>193</sup> Surr Report, paragraph 165.

<sup>194</sup> It should be noted that some recipient governments are also seeking to reduce transaction costs in research and other funding, by insisting on donors pooling their resources in specific nationally controlled 'funding baskets'. This idea appeared to be particularly advanced in Uganda. This has the potential for conflict between the aims of centrally funded research programmes and the control on who can fund what through basket funding at the country level (see also paragraph 154).

research consortia should involve only ‘research’ institutions but they may need to be encouraged to seek partners from other parts of the innovation system.

347. The arrangement under which the CPH Programme was run by NR International has not been without its critics and problems of implementation. However, the separation does seem to have provided increased flexibility in implementing an Innovation Systems approach. The innovation literature attaches considerable importance to the role of ‘intermediary organisations’ and the balance of power relations between the supply side and the knowledge side of the innovation system. This is probably easier to achieve when fund management is kept separate.

348. Both DRC and ‘Research Programme Management’ models provide opportunities for intellectual leadership, but they are likely to be of different types. The advantage of DRCs is that they can be selected precisely because they are believed to have the intellectual capacities to design and implement programmes that make an original contribution to knowledge. The Research Programme managers can also exercise intellectual leadership, but probably in a different way, for instance, by managing the processes necessary to determine what the needs are, by establishing what others are doing, and by searching out and nurturing the individuals and institutions (including coalitions) that can make an effective contribution. However, the extent to which the CPH Programme added value in practice by producing international public goods at the Programme level was probably less than desired. As suggested at paragraph 266, there is still more that could be done in the next phase to exploit this largely untapped resource.

#### *Is the IS Approach too Complicated?*

349. It is certainly the case that the IS approach is more complicated than administering a passive research grant programme. However, the CPH Programme’s experience shows that the passive approach is probably no longer an option if the objective is impact through innovation. The CPH Programme demonstrates the necessity of an interventionist approach to the formation of coalitions, that innovation requires capacities to be strengthened in many parts of the ‘system’, and engagement between the public and private sectors has to be facilitated. The CPH Programme also demonstrates that the key elements of the IS approach are simple, widely understood and that they can be implemented effectively even at the level of individual projects.

#### *Is the IS Approach too Costly?*

350. Certainly there are additional costs associated with the proactive interventions necessary to bring key actors to work together and to strengthen the weaker elements of the system to facilitate innovation. There is, however, some confusion about the costs involved. In most cases, these are not ‘overheads’ that need reducing, but rather ‘investments’ in capacities that are necessary for innovation. The costs may be high, but the costs of not doing it are higher. Only in those innovation systems that are well resourced and operating effectively is a passive approach to research funding possible.

351. There are also costs involved with the competitive tendering approach, and these were increased by the CPH Programme’s requirements. Some of these costs were reduced by the combination of short concept documents preceding full proposals. Some other costs were reimbursed. In future, such costs could be lowered by having larger projects and longer projects. Nevertheless, these costs remain a major problem for many partners, including the private sector, which cannot afford the time to participate in lengthy meetings.



*DFID's Role in Global and National Innovation Systems*

352. The CPH Programme shows that the way that DFID organises its research is a major determinant of its effectiveness. DFID's rules and procedures both constrain and empower its contractors. During the field visits, there was a strong sense that both researchers and research managers wanted far greater links with DFID's country offices and country programmes<sup>195</sup>. While this may well run counter to current rules and philosophy within DFID, it appears to be an inevitable consequence of DFID wanting research to have more impact on the ground<sup>196</sup>.

353. The IS literature suggests that organisations such as DFID could add substantial value to its research investment if it were to 'partner' more effectively with the researchers it finances and in some sense 'own' the knowledge generated. Yet, over the period of the RNRRS, DFID has largely abrogated this responsibility and, as one researcher commented, tended to "contract out its brain". This left three major gaps: links between research funded by DFID's Central Research Department and DFID's other activities in developing countries; the lack of 'ownership', which has meant that DFID has been unable to play its part in feeding these results into the international development process using the networks in which it is involved, *qua* UK government; and it has under-invested in systematic cross-Programme efforts, which are necessary to learn from its research management experience and use the knowledge gained to strengthen the evolution of the Programmes<sup>197</sup>.

354. At one level, DFID has sought to 'learn the lessons' continuously from the CPH Programme through its representation on the governance system, namely the PAC, but it is likely to need much more than this. Given the reduction in DFID staff, it is likely to require a dedicated team (externally if need be) whose function is not to monitor financial and management issues, but to learn the lessons from both the process and product of the research DFID finances. DFID needs to develop the capacity to meet its obligation to feed this knowledge into key 'pressure points' of the international development process.

355. DFID also probably needs to foster a culture in which research contractors are encouraged to report what they have learned rather than report 'success'. This latter seems to be an unintended consequence of competitive tendering<sup>198</sup>. Part of this change in culture will mean DFID-funded researchers being rewarded as much for achieving poverty-reducing innovation as for the number and quality of their publications.

356. Hopefully, DFID's role in the international innovation systems will be clarified and strengthened in their forthcoming "Science and Innovation Strategy".

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<sup>195</sup> DFID makes the point that a closer relationship with DFID country offices might be a mixed blessing. At worst, it might mean that, if contact with the local office was a requirement of future research funding, then refusal of a country office to fulfil this role would mean that DFID's centrally funded research could not take place in that country. Similar points have been made by British researchers who like the fact that DFID does not interfere in the decision about what is, and what is not, researched

<sup>196</sup> Certainly there have been people within country programmes that also saw the value of research and were keen to both learn from the research and help to disseminate the results. The same very few names of DFID staff were mentioned frequently as being particularly helpful.

<sup>197</sup> This is one of the main conclusions of the RNRRS synthesis study on innovation.

<sup>198</sup> Typical such pressures were described by the Director of a large NGO in south India. He described himself and people like him as "success driven writers" and he believed that "donors only ask if you are successful". He explicitly stated that for him "incentives are not to report failures and learning".

### *The Need to Exploit the UK's comparative advantage*

357. A major challenge for DFID will be how best to exploit the UK's comparative advantage both in funding, and in carrying out, research. Part of DFID's comparative advantage stems from the potential flexibility of its procedures, from its long experience in funding research, and from the capacities of British institutions and people.

358. Although the responsibility for maintaining and building the UK capability in the future does not necessarily fall to DFID, it would appear that DFID should have some interest in how effectively it is maintained and developed<sup>199</sup>, not least because many of its advisors gained experience and training by undertaking research.

359. The challenge will be to utilise UK capacities in ways that do not infringe the policy to 'untie' British aid to research, and in ways that complement, rather than undermine, the innovation systems of developing countries. Part of the solution will be to develop a clearer idea of what precisely it is that British institutions do best (their current and future comparative advantage). This is discussed in some detail in relation to the CPH Programme in Chapter 10.

### *Public Goods and the Issue of Access*

360. An important lesson for DFID that arises from the CPH Programme concerns access to the results of DFID-funded research. While one of the objectives of DFID centrally funded research is to produce 'public-good knowledge', there is considerable confusion about what this means in practice. Many UK researchers who were interviewed say they face conflicting incentives: either to share their knowledge or to publish in journals that help their careers but are largely unavailable in developing countries. This problem is described in more detail in the following chapter. The lesson for DFID is that there is uncertainty and this situation needs to be resolved. At the least, contractual arrangements should be put in place to ensure that, if research outputs are not published within a fixed period after the research contract ends (such as a year), then their Final Technical Report (that must contain the main results of the research) and associated data sets can be placed on the web by the Programme.

### *What Criteria might DFID use to Ensure an Innovation Approach?*

361. From this and other chapters it should, in principle, be possible to develop a set of criteria that DFID might use in its tendering process to ensure that successful contractors adopt an innovation approach. These might involve making it explicit that bids would be favoured that:

- Give equal weight to poverty-reducing impact and the production of national and international public-good knowledge;
- Guide the allocation of resources by a process of 'system diagnosis' and problem specification that involved a wide range of stakeholders;
- Demonstrate how 'intermediary organisations' will be utilised to facilitate interactions between the producers of new knowledge and the users of new knowledge;

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<sup>199</sup> The question of responsibility for maintaining British capability in science and technology of relevance to developing countries was dealt with in part in the recent report of the House of Commons Select Committee on Science and Technology.



- Develop consortia (or coalitions) in which ‘users’ of new knowledge as well as suppliers of such knowledge are fundamentally involved at the outset (and distinguish between users of new knowledge and ‘beneficiaries’);
- Develop networks that facilitate effective, continuous and ‘two-way’ communication between the different elements within the innovation system;
- Develop consortia and networks that go beyond ‘partnerships’ between research institutions, and go beyond ‘participation’ just with farmers and other beneficiaries;
- Involve the full range of skills necessary to solve a problem (particularly ensuring that ‘social science’ skills are combined in strategic partnerships with scientific and technological institutions that really understand the underlying science and technology of the problem they are addressing) and produce international public-good knowledge;
- Demonstrate knowledge of, and an ability to build on, the activities of other research funders, including local governments;
- Demonstrate an ability to identify and utilise the UK’s comparative advantage.

## 9 Lessons for Managing Research Programmes

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362. It is not within the terms of reference of this review to examine how well NR International has managed the Crop Post-Harvest Programme. However, many of the conclusions from previous chapters have implications for the way that Programmes are managed. This review of the portfolio of projects did provide insights into the issues that research-fund managers face in general, but particularly when they take on an Innovation Systems approach.

363. The reasons for adopting the ‘Partnerships for Innovation’ approach were discussed in Chapter 3. The CPH Programme has shown itself both willing to learn and willing to innovate. The management has subjected itself to independent review and criticism and has adopted a flexible approach that facilitated change. Once the decision was taken, firm actions were taken to steer the staff, project contractors and Regional Offices in the new direction.

364. Many of the characteristics and problems of the CPH Programme derive from the decisions taken by DFID at the outset of the Programme to divide the funds into particular thematic areas, such as crop post-harvest systems, and to locate the management of the Programmes in the UK. In the next round of funding, resources will be allocated to ‘Regional Research Programmes’ in East, West and Southern Africa as well as South Asia. Some problems will disappear while others will increase.

365. If an innovation approach is adopted to these new Programmes, as suggested in the previous chapters, the CPH Programme’s experience suggests that the Programmes will need to:

- Take an interventionist approach to programme and project development, including support to project development, mentoring and support;
- Instigate processes for ‘innovation systems diagnosis’, which establishes a vision of the strengths and weakness of the processes by which new knowledge is transformed into goods and services, but is also able to evolve as greater experience is gained. This will be substantially different from previous ‘technology needs assessments’;
- Invest in networks that enable a wide range of stakeholders to engage in the innovation process, paying particular attention to seeking the views of a wider range of actors, particularly actual and potential users of new knowledge. This will extend ‘participatory processes’ beyond final users (such as farmers) to actors such as manufactures, retailers, providers of credit and business development services;
- Consider investments to strengthen parts of the innovation system in addition to those associated with ‘research’;
- Take a strategic view at the outset about the processes required to produce international public goods. This will involve allocating resources to learn the lessons from the processes of innovation, in terms of both the process itself and the substantive content, in order to produce national and international public goods, as well as transform knowledge into goods and services that reduce poverty.

### *New Areas of Concern*

366. The CPH Programme's experience indicates four areas of concern: tendering; regional versus country representation; Programme-level public-good knowledge; and access to new knowledge.

### *The Competitive Tendering Model*

367. The CPH Programme's experience shows just how big a challenge it will be for Programme Managers to provide a level playing field for the competitive tendering of 'research' contracts. A guidance note to staff quoted by the Surr Report states that:

*Even with the best will in the world, it will be difficult for many non-British institutions, in particular from developing countries, to break into the market for DFID research funds. This is for a variety of reasons (e.g. proposal writing skills, familiarity with DFID procedures, scale, culture) and has been demonstrated in recent competitions which were not tied<sup>200</sup>.*

368. This presents a major challenge for research managers in finding ways to enable developing-country institutions to learn what DFID (or any other donor) wants, and to set up procurement systems in which the value of insider knowledge is limited. Even where there is a separation between management and research, many informal networks exist that link some researchers more effectively than others with research funders. Such interactions are inevitable and may well form part of a successful innovation process. On the whole, the CPH Programme managed these relationships effectively, but it was not easy and they did not always get it right<sup>201</sup>.

369. More generally, there were examples of complex power relations between the people involved<sup>202</sup>. There are clear lessons from this experience. It will be important to acknowledge the existence of these interconnections more explicitly, to find mechanisms to build trust with a wider range of players (for instance, by face-to-face contact rather than e-mail), and to ensure that such 'social capital' does not exclude critically important players, just because they are newcomers.

370. The costs of competitive tendering can be large, and the CPH Programme developed a number of mechanisms either to minimise them or to fund them, although, as suggested in the previous chapter, they remained substantial for many players. These costs could probably be further reduced in consultation with potential bidders and with DFID.

371. The move to regional and country research programmes will provide an opportunity for reducing tendering and other transaction costs through the use of 'programme' rather than 'project' funding. This involves providing larger (though necessarily fewer) grants and adopting more of a process model, in which tasks, objectives and outcomes are allowed to evolve as the participants gain more knowledge and experience. In such an

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<sup>200</sup> Quoted in the Surr Report, paragraph 186, where the reference is given as paragraph 6 of Funding research Post-Untying: Guidance for Staff, no date, no reference (attached to memo from Phil Marker 23 April 2001. 90 HM letter to DFID dated 9 July 2002 setting out DFID's budget settlement for 2003–06).

<sup>201</sup> DFID's guidance note cited in footnote 200, goes on to suggest that "... research and other programme managers need to consider whether the objectives of untying could be served by new approaches to research procurement. This could include for instance, special programmes with a capacity building objective orientated to developing countries. Other imaginative ways of procuring research, and developing research capabilities, in developing countries need to be experimented with". CPHP seems to have done this.

<sup>202</sup> One sub-set of this issue was the fact that some people were working some of the time as equals in research partnerships, while at other times they were working in highly dependent relationships as PhD students with their supervisors.

approach, a balance has to be struck between exercising accountability and ‘control’ on the one hand, and trusting regional and country staff to act responsibly on the other.

372. However, there are downside consequences of large contracts: one tendency is that the winner takes all, as the competitors wither and die due to lack of alternative funds; another is that all potential bidders adopt ‘gaming’ responses and form strategic alliances so that they all have a high chance of winning something from the tendering process rather than having a low chance of winning a great deal.

373. Generally it has been argued earlier that innovation coalition projects need to be larger than recent projects of the CPH Programme, not only to reduce the costs of tendering but so that each partner can attain a critical mass of effort.

#### *Country versus Regional Representation*

374. It is difficult to believe that the recent CPH Programme would have been possible without the Regional Offices. They have been a considerable success. However, the CPH Programme’s experience points to four areas of concern. First, there is a tendency for Regional Offices to become country offices. This underlines the importance of a local presence and the need for local knowledge to manage innovation effectively. It is just difficult for Regional Offices to gain the same level of understanding and to maintain the contacts in other countries in the Region. Regional Offices tend to do more work near to the base office<sup>203</sup>. This may well be a major problem for DFID’s future Regional Research Programmes and will be compounded by the substantial differences in the circumstances facing the individual countries within a region. While there may be new knowledge that is of relevance to a region, a country’s ability to use this knowledge will be a function of its own national innovation system, infrastructure and framework conditions.

375. Second, there is a danger that the roles of Regional Offices become confused in the minds of governments and contractors as the staff become more involved in projects. In India, for instance, one project praised the catalytic role that the Regional Office played in bringing a project coalition into existence and in writing the project proposal, but was deeply shocked when the Regional Office staff member “withdrew from the project” and was replaced by someone from the UK who “never really understood the project” and did not get on with the project manager.

376. Third, the legitimate desire to delegate both funds and decision making to the Regional Offices may weaken the overall quality assurance and lesson-learning mechanisms at the Programme level. In the proposed new DFID funding scheme, this problem is likely to arise in the relationship between the region and the individual countries within the region. Clearly these systems only work with a high degree of trust, but a balance has to be struck between trust and good governance, and between the interests of a country Programme and the intellectual needs of the overall Programme.

377. Fourth, from the point of view of the outside observer it appeared that the CPH Programme often had difficulty building on, or contributing to, the research activities funded by others, such as the host government, other foreign donors, such as the World Bank, or even other parts of DFID. This situation is no doubt eased at one level by local in-country representation, but might well lead to greater difficulties in locating new work

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<sup>203</sup> Of course, this is not always the case, for instance, the Southern Africa Regional Office has undertaken a considerable amount of project activity outside Zimbabwe.

in the context of work going on in other parts of the world. The new Regional Programmes have the potential to contribute to the region but it seems likely that particular mechanisms will have to be put in place to ensure that they also contribute to the *global* effort.

### *Investing in Learning to Produce Programme Public-Good Knowledge*

378. Much has been made in previous chapters of the need to invest funds at the Programme level in order to compare and contrast the results of similar projects across a number of countries and to synthesise the results for a wider audience. This is not an inherent weakness of the research management model, but does point to the need for future programmes to plan specifically for, and invest in, the extraction of these public-good knowledge products.

379. DFID itself argues for this type of synthesis when it says in its new Research Framework, “as part of our research programmes, we will support synthesis reviews of available knowledge. Synthesis reviews that distil and evaluate available evidence can greatly facilitate objective decision-making by policymakers and technology users – many of whom are bombarded by a wealth of (often) conflicting information” (paragraph 52).

380. While it remains important for the funding body to be able to terminate support for lines of inquiry that reach a dead-end, even more might have been achieved if there had been a more strategic vision of what had to be achieved at the level of both a whole country and the whole programme. In such a case, each project might have been viewed as part of a pre-planned sequence designed to achieve a bigger goal<sup>204</sup>.

381. The shift in focus to regional programmes will require mechanisms to be put in place to communicate with, and learn from, other regional programmes. The possibility of duplication of effort between regions is likely to be greatly increased under the next round of DFID research funding.

### *Access to ‘Public-Good’ Documentation*

382. In the course of this review, a large number of documents were examined. In general, the project proposal documents and Logical Frameworks were informative. However, this was less so with the Final Technical Reports (FTRs), whose usefulness varied considerably. The format of the FTR has been changed over the years, but it would seem that researchers have very different views about what should and should not be put in it. At one level, it would appear that project teams have a contractual obligation to put the results of their research into the public domain, together with major data sets (or at least to say where the data sets are located). At another level, there are researchers who are concerned to minimise what is put in the FTR so as not to jeopardise their chance of publishing the results in peer-reviewed scientific journals. There appears to be no evidence that ‘prior publication’ of results in a FTR (even if it were put on the web) has ever in fact prevented subsequent publication in a journal. FTRs are sent out for independent review and are sent back to the authors for revision where there are major concerns. There do not appear to have been cases where the final project payments have been denied on the

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<sup>204</sup> Peter Golob, a member of the PAC, expressed a similar view when he argued that: “The absence of a consistent strategy from the outset of the Programme led to inappropriate planning, which prevented some longer-term outputs being achieved by the termination of project clusters. Future programmes would be more effective if composed of fewer but larger and longer projects. Such an approach would allow even relatively academic, upstream research to progress towards practical implementation and yet be regularly monitored to ensure achievement of milestones and objectives”: see his Thematic review of the loss reduction projects funded by the Crop Post-Harvest Programme, draft, August 2004 (storage technologies).

grounds that the FTR did not achieve an acceptable standard or did not cover what was specified in the contract. Surprisingly, the PAC's own review of its effectiveness<sup>205</sup> notes that even they did not see FTRs routinely, even though many were reviewed by individual PAC members.

383. Many researchers remarked on the conflicting incentives that they faced. For many of them, promotion depended on the number and quality of their scientific publications, while the incentive for other project partners (and indeed the funder) was that the research should have an impact on poor people, and would have its greatest impact when put into the public domain. It seems likely that these conflicting incentive structures could be resolved either by the research fund manager or by DFID. In particular, it would appear that contractual arrangements should be put in place to ensure that, if research outputs are not published within a fixed period after the research contract ends (such as a year), then the Final Technical Report and associated data sets will be placed on the web. In response to a House of Commons Select Committee, this would now appear to be Government policy<sup>206</sup>.

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<sup>205</sup> see paragraph 397 below.

<sup>206</sup> <http://www.publications.parliament.uk/pa/cm200405/cmselect/cmsctech/235/23504.htm>. Recommendation paragraph 27.





## 10 Lessons for UK Research Institutes

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384. The portfolio of projects provides valuable insights into the changing role of organisations and individuals in northern industrialised countries in contributing to the CPH Programme. Although NRI at the University of Greenwich has been the major source of expatriate input to the CPH Programme, a number of other British institutions have managed projects and supplied individual researchers. The comments that follow therefore do not refer exclusively to NRI.

385. Undoubtedly British institutions and people have provided high-quality research and made a valuable contribution to the Programme. However, as described in Chapter 3, they have also suffered considerable hardship in recent years as the proportion of DFID research funds that they have attracted has fallen.

386. During the review, it was striking just how much developing countries resented the huge differences in the proportion of project funds going to UK staff and institutions. Researchers in all countries mentioned this and referred to **all** UK institutions. It was a considerable area of conflict. In some of the early cases, it seems likely that attempts were explicitly made to minimise these conflicts by keeping budgets secret.. However, in more recent projects, the balance of funding seems to be more transparent and equal. This has been accompanied by strenuous efforts to ensure that developing-country researchers are acknowledge as joint authors in the CPH Programme's publications. This is highly appreciated.

387. However, the fact remains that the costs of doing research in the UK and other industrialised countries are far higher than in developing countries. In some cases, the CPH Programme's contribution to a single expatriate exceeded the total budget available to the crop post-harvest research institutions funded by the local government<sup>207</sup>. Ultimately it became untenable to have expatriates spending long periods of time resident in developing countries.

### *UK Institutions' 'Comparative Advantage'*

388. The relative costs of researchers in the north and south focuses attention on a key question of the so-called 'comparative advantage' of foreign (UK) institutions. The CPH Programme is able to shed light on this. From an analysis of a large number of interviews, it is clear that the major contribution of UK expertise to the CPH Programme is widely recognised and highly valued. The main advantages of institutions in industrialised countries were reported to be their ability to: contribute experience from a wider and longer international experience; synthesise experience across a number of countries and regions; write reports that are credible to international policy makers (World Bank, DFID, EU, FAO (Food and Agriculture Organisation)); and raise funds. UK institutions have also provided rapid and flexible procurement of equipment and services, and provide 'protection' for local researchers in sensitive areas of research.

389. The following list provides a summary of the major positive contributions mentioned in interviews of researchers:

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<sup>207</sup> This appears to be the case with Dr Raman's IGMRI Hyderabad, and at the Food Research Institute in Ghana.

- *'Policing'*. It was felt that a foreign institution was more able to ensure compliance with contract terms and timetables than indigenous organisations (who were aware that they would have to work with the same colleagues for many years to come and may well need them as allies in future). Indeed some of the criticism levelled at expatriates is now being levelled at locally based managing partners.
- *'Technical back stopping'*. In particular, it was recognised that foreign researchers were able to contribute experience from a wider and longer international experience.
- *Fund raising*. Many respondents in developing countries specifically mentioned NRI's ability to attract funds, particularly in recent years from the EU. This was extremely valuable (especially as the EU terms usually required partners from at least two European countries).
- *Rapid procurement*. UK institutions in general, and NRI in particular, were complimented on their ability to procure and deliver equipment and consumables very quickly indeed, and being able to bypass the complex and time-consuming rules that apply to Ghanaian and Indian institutions.
- *Training for MSc and PhD*. Despite the fact that 'training' was generally not allowed in DFID centrally funded research projects, it appears that northern partners had found ways to provide and fund MSc and PhD training for developing-country researchers. This was much appreciated as promotion often depends on such qualifications. However, some senior staff in developing countries thought that short-course training was often more valuable. As British institutions derive income from these training activities, great care needs to be exercised to see that there are no conflicts of interest in the choice of candidates or the types of course on which they are placed.
- *Cash flow*. Some UK institutions appear to be able to carry project cash flow that many organisations (particularly NGOs) cannot<sup>208</sup>.
- *Sophisticated equipment*. Where very advanced science, or esoteric procedures, are involved, UK institutions were seen as providing particularly useful inputs.
- *Sensitive policy advice*. This was said to be more easily provided by expatriate organisations where such advice is either highly political in the developing-country context or highly sensitive within DFID.
- *Independent validation*. UK institutions were said to supply a valuable service by providing independent validation or corroboration of sensitive research results (this was cited in the case of heavy metals found in food crops in India). Indian institutions were said to be quite able to undertake the analyses, but need foreign support to avoid the charge of bias.
- *Specialist advocacy skills*. It was suggested that UK institutions were particularly skilled at writing scientific and other reports that were designed to influence international policy makers (World Bank, DFID, EU, FAO).

### *The Lessons Learned*

390. There would seem to be a pressing need for British institutions (and for DFID) to define more clearly where their comparative advantage lies, and to find mechanisms through which their contribution can be made on a sustained basis and at reasonable cost.

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<sup>208</sup> NR International does now also allow early invoicing.

391. The House of Common Select Committee on Science and Technology has underlined the necessity for the British Government (rather than DFID alone) to take responsibility for ensuring that British capacity to contribute effectively to reducing poverty in developing countries is maintained and further developed.

392. Given that some UK institutions were involved in a number of similar projects, it would appear that they could usefully have been funded to do more to exploit this advantage and draw out the lessons from their experience in many countries. However, there are sensitivities here and it would have to be done in such a way that it is not perceived as exploiting the research of developing countries.

393. More generally, the UK is said to be the world leader in multidisciplinary development studies: it may be that the production of international public-good knowledge for the institutional lessons learned at the project level is part of the UK comparative advantage. However, even if this is so in the short run, it will be important in the next phase to make sure that this capacity is also developed in Africa over the next ten years .



# 11 Lessons for the Governance of Research

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394. The CPH Programme set up a governance structure that included a Programme Advisory Committee. The CPH Programme was said to be the only one of the RNRRS Programmes to expand the membership of its PAC to include people from developing countries.

395. More generally, this is in keeping with the IS approach, which suggests that successful innovation requires changes in the governance of the research programmes to prevent ‘capture’ by any one particular interest group, and particularly to strengthen the voice of what might be called the ‘users’ of new knowledge. This implies the need to widen the representation on future PACs both in the UK and in country or regional programmes. It is now common practice in Europe to widen the range of people who perform these governance and referee functions to include those in the productive and service sectors as well as research and public-sector staff. The increase in information and communication technology makes this more feasible.

396. The PAC made, or supported, changes in the strategic direction of the Programme in many ways. In retrospect, though, it seems the PAC might have been more insistent that the Programme added value to the research work both at the level of larger cross-cutting themes and indeed whole countries. Furthermore, while huge effort was put into the appraisal of proposals, there was probably a need to increase the inputs to the quality assurance processes at the end of projects in relation to project documentation and the generation of international public goods<sup>209</sup>.

397. These and other lessons from the experience of the Programme Advisory Committee have been usefully drawn out in their own publication: *The Crop Post-Harvest Programme Advisory Committee: a review 1995–2004*, by John Coulter and Frank Almond, July 2004. In summary, those most relevant to the current exercise would appear to be:

- *The issue of science.* “There were always active concerns about ‘balance’; and in particular whether the PAC was paying enough attention to the bigger picture in science terms. Specifically, the need to ensure that the overall pattern of research reflected international priorities, and that it was ‘additive’ in the sense that it filled genuine gaps, and complemented existing knowledge. There was also concern that, whatever the balance of issues, a scientific research approach should not be neglected.”
- *Lesson learning.* “More opportunities could have been made to share lessons across programmes at a PAC level, to have improved project lesson-learning through more systematic reporting back, and to have had more structured links to DFID to improve policy debate.”
- “Lesson-learning could have been more deliberately factored in. The fact that project Final Technical Reports were not circulated to the PAC, for example, hampered their ability to monitor the success of the Programme. In retrospect, more opportunity should have been created for an exchange of experiences and lessons between research programmes at a PAC-to-PAC level. The absence of this

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<sup>209</sup> It has been pointed out that a large number of FTRs were reviewed by individual members of the PAC.

probably reflects a more general lack of contact at a programme-to-programme level.”

- *Strategic advice to DFID.* “The PAC constitutes a large body of specialist expertise, and there was some sense that not enough opportunity was taken – either by the PAC or by DFID being more proactive – to make use of that expertise in policy dialogue. A separate channel of communication would have helped, since there was reluctance to use PAC meetings for wider ranging debates on issues that might have ranged beyond the PAC’s immediate responsibilities, or which might have detracted from the DFID/Programme Manager relationship. Indeed, such a mechanism might have been useful at a cross-programme level. The PAC also felt that it could have been more proactive in building links with the other DFID programmes.”

## 12 Conclusions

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398. This review describes the bold and imaginative process by which the staff of DFID's Crop Post-Harvest Programme have transformed the way they work. They have effectively transformed the Programme from one that focused on research and the delivery of scientific knowledge, to one focused on 'innovation', that is, on the generation and transformation of new knowledge into goods and services that reduce poverty. This experience in applying an Innovation Systems approach to research management provides lessons for the future of British development research and guidance to the managers of research programmes and projects.

399. Some of the opposition to the innovation approach seems to be based on a misunderstanding. It is not a new fad, nor is it 'anti science'. It is a summary of best practice in many countries over many years for integrating scientific and other knowledge into the continuous improvement of production of goods and services. It certainly involves a different perspective, a different set of incentives, and changes in power relations between the various actors. It is about evolution, learning from experience, networks and the operation of systems.

400. Innovation requires a systems perspective and the allocation of resources based on a 'systems diagnosis'. This diagnosis can be simple or complex (adopting different 'fractal levels' of analysis depending on the resources available and how wide the problem boundaries are set). It also requires a vision of the strengths and weaknesses of the system involved in effective innovation, rather than a focus on narrowly defined 'research'.

401. Whether or not the Innovation Systems approach to research management is in some sense better than any other must surely depend on what the objective is. If DFID wants its investment in research to achieve poverty impacts, then this is most likely to be achieved through adequately functioning 'innovation systems'. If innovation is the objective, then the world has a huge experience about how to do it. Yet it does mean that it is critically important (as the RNRRS Evaluation also concludes) for DFID to specify clearly what it wants to achieve from its research investment.

402. The CPH Programme demonstrates that the innovation approach can, in principle, provide both 'impact' and public-good knowledge at both the national and international level. However, the research evaluation literature shows that attributing particular research investments to particular impacts is difficult, if not impossible. The innovation systems literature tells us that innovation of any kind is going to be difficult with existing framework conditions and lack of infrastructure facing developing countries. It is unlikely that individual programmes, let alone projects, can buck international trends that are operating against poor people in renewable natural resource systems.

403. The recent experience of the CPH Programme also demonstrates the dangers of innovation investments being overly focused on short-term impact at the local level. The evidence shows that, to obtain the greatest value from this investment, it is necessary to devote resources explicitly to the learning processes needed to extract the higher-level generalisation about both the process (programme management and innovation) and the content of the innovation process. The CPH Programme's experience suggests that these learning processes probably need specialists who can link local research results to the wider international experience.



404. Experience shows that successful innovation requires high-quality science, but it is likely that, if an innovation approach is adopted, the focus of the scientific research will change, as a result of the continuous interaction between researchers and other elements of the innovation system. This also suggests that a very flexible and evolutionary approach to Programme finance and management will be required.

405. This review of the CPH Programme's experience shows that, if the objective is the reform of national agricultural research systems to enable them to contribute more effectively to poverty-reducing innovation, this will require a wider range of instruments, beyond those of narrowly defined 'research' projects. Many of the problems faced by research systems derive from the incentives and disincentives facing the various actors in the system. These probably need to be addressed directly using the instruments associated with good governance and institutional reform. Successful innovation requires a shift of power from a narrower to a wider set of actors and changes in the governance of resources to prevent 'capture' by any one particular interest group. This in turn raises important questions about whose (research) priorities are to be met, and who wins and who loses from research and the process of change.

406. Strengthening innovation systems in developing countries is a large task. It will inevitably involve strengthening local scientific, technological and other capacities. This will be expensive and will require long-term commitment. This points to the need for DFID to work with other donors at the international level, and to facilitate research funding groups at the national level that include governments, other donors and Foundations etc. More importantly, it suggests that DFID itself has a major role (and responsibility) to learn from the experience of DFID-funded research and feed it into the international development process.

407. The future of DFID's funding for research faces two major challenges. First, whether to provide its finance through existing national or regional organisations in developing countries, or whether to set up new institutions such as Regional Offices (or UK-based programmes) in parallel to existing institutions. Second, how to identify and better utilise the UK's comparative advantage in this endeavour.

408. Much valuable work has been undertaken by the CPH Programme that is likely to have favourable consequences for many years to come, even if direct poverty-reducing impact is difficult to attribute to particular projects at this time. DFID's current intention to fund a "facility to add value to this massive resource" is certainly supported by the findings of this review.

## Annex 1. Terms of Reference

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The original terms of reference (dated 4 July 2003) and the work plan were revised to enable more time to elapse for project impact to occur in the response to the extension of the RNRRS to 31 March 2006.

### *Summary*

A1. The evaluation will be undertaken to extract the positive and negative lessons that can be learned from the way that the CPH Programme has evolved over its lifetime. This will involve two sets of semi-structured interviews in the UK and developing countries: the first, to be undertaken in 2003, will examine a sample of completed projects; and the second will examine a sample of ongoing projects towards their completion in the last half of 2004. An interim progress report will be completed early in 2004, and a final report will be produced at the end of 2005. The final report will be summarised in a number of different forms to meet the needs of different audiences. The evaluation will be undertaken by Andrew Barnett of Sussex Research Associates Ltd. Staff of NR International both in the UK and overseas will contribute to the activities as specified below.

### *Purpose*

A2. The purpose of this activity is to undertake an evaluation of the Crop Post-Harvest Programme as a whole, in order to add value by extracting the positive and negative lessons that can be learned from the various approaches that have been used, particularly from the traditional form of research contracts, through the 'Partnerships for Innovation' approach to project management, and the 'coalition approach' to project design and implementation, to the current National Systems of Innovation approach.

### *The Questions to be Addressed*

A3. According to the current Log Frame, the purpose of the CPH Programme is that "national and international crop post-harvest innovation systems respond more effectively to the needs of the poor".

A4. This suggests that the key lessons to be learned should focus on whether the new approach is in some sense more effective than the previous one. This in turn requires the evaluation exercise to elaborate the essential elements of the new approach, the extent to which these elements are addressed in the new projects, the elaboration of the changing nature of outcomes that are to be achieved more effectively and what improvements can be expected.

A5. DFID's funds usually form only a small part of the resources currently going into any particular innovation sub-system, and it will therefore be difficult if not impossible to ascribe any particular outcome to DFID's limited input. Furthermore, in addition to the well known problems of 'attribution', the limited lapsed time between the start of the CPH Programme's new projects and the evaluation further limit what can be expected in terms of observable change.

A6. While the purpose of DFID centrally funded research has always been the reduction of poverty in developing countries, the new approaches place greater emphasis on 'process outcomes' such as changes in the behaviour of systems, the building of

capacities and ‘institutional learning’, rather than the production of research papers or the development of a new device or technique (or even than direct poverty reduction). It is unlikely that it will be possible to determine quantitative links between inputs and outcomes in statistically significant terms.

A7. In sum, the aim will be to go beyond projects and regions to the level of the whole programme in order to derive ‘higher-level generalisations’ about the ‘lessons learned’ rather than to provide a blueprint for best practice.

### *Tasks*

A8. *Task 1. Developing a common understanding of the “new model”.* A process involving the preparation of papers and presentations to the CPH Programme’s staff in the UK and overseas to develop a clear and commonly held view about the approaches used by CPH Programme and the extent to which they reflect ‘innovation system’ thinking.

A9. It is understood that many of the coalition projects have been developed ‘organically’ through processes of negotiation and therefore reflect differing contexts and differing interpretations of the underlying principles of innovation systems.

A10. *Task 2. Baseline analyses of a sample of coalition projects.* In order to extract the lessons from the experience provided by the programme’s ongoing portfolio of projects document baseline information. Advice will be provided as to how this process can form an extension of routine project monitoring processes and so that it provides a benchmark against which to examine changes resulting from the projects’ activities. This baseline work will be carried out by September 2003 by project teams with the assistance of the Regional Coordinators and written advice has already been provided as to how these need to be improved.

A11. The baselines will identify those elements of the ‘innovation systems’ in which the current crop of new projects is operating, and in which elements have been targeted for change. As a minimum, each baseline will provide some institutional mapping of the innovation sub-system in which each project activity is taking place so as to identify the strengths and weaknesses of the current ‘system’ and identify those weak or missing elements of organisational partnerships, institutional capacity, knowledge, or enabling environment that are to be addressed during the project.

A12. *Task 3. A backward look using a ‘NSI lens’.* This will be a relatively quick and largely subjective examination of a sample of the portfolio of the previous 7 years project activity within the CPH Programme. The aim will be to try to explain subjective impressions of success/failure in terms of the existence or absence of the various elements of the innovation systems (and partnerships) in which the activity took place. It is believed that many elements of the portfolio of completed projects were ‘successful’ both in their own terms or in the wider terms of successful innovation, institutional learning and behavioural change. The hypothesis is that these successes and failures were in part due to the existence or absence of the other parts of the ‘system’ necessary for successful innovation. Clearly successful research can lead to innovation even if the inputs to the process are not seen by the participants as forming part of a knowledge or innovation system.

A13. This task will be carried out primarily by Andrew Barnett with the assistance of the Regional Coordinators. A sample of projects will be examined in three of the four regions (Ghana, India and either Uganda or Zimbabwe). Visits will last approximately 14 days and will take place between September 1st and November 31st 2003.

A14. The sample will be agreed in advance by the evaluator and the CPH Programme's staff. The sample will be drawn on the basis of a sampling frame developed by the CPH Programme's staff in the UK (with the assistance of Michael Flint). This will list all completed projects (projects relating to the same topic may be grouped together if this adds clarity) and score them according to two sets of indicators: conventional evaluation indicators including impact and uptake, and indicators of the extent to which the projects contain characteristics of the National Systems of Innovation Approach. It is anticipated that an initial draft of this sampling frame will be available early in September 2003.

A15. The findings of this first part of the evaluation will be written up in a short report (with country annexes) in the early part of 2004.

A16. *Task 4. 'Coalition project evaluations'.* This task will be the main lesson learning evaluation of a sample of coalition projects that will take place towards the end of each project's existence (i.e. towards the end of 2005). This task will again be undertaken by Andrew Barnett with the assistance of the Regional Coordinators. It is expected that these evaluations will be undertaken in partnership with the project teams and in consultation with other stakeholders.

A17. The total population of recent projects in three of the four regions would be examined (probably the same three countries as visited in task 3). Visits will last approximately 14 days and will take place between September 1st and November 31st 2004.

A18. Efforts will also be made to consult key stakeholders in the relevant innovation systems, including those not directly involved as coalition partners. Consideration might also be given to enabling each Regional Coordinator to contribute to the evaluation of other regions.

A19. *Task 5. The Final Report.* The final report would be the responsibility of Andrew Barnett. It will be a two step process in which a first draft (produced at the end of 2004) will be circulated to primary stakeholders (including the Programme management and Regional Coordinators) for comment, and a final version would be produced in the light of comments received. The final report will not exceed 30 pages (excluding annexes) [this was subsequently changed to 100 pages].

A20. In the spirit of the innovation system thinking it will be important to tailor different versions of the final report to meet the needs of a number of different audiences. This may include stakeholders in the National Systems of Innovation in developing countries, CPH researchers, DFID, and the wider international community involved and the management of research and the strengthening of innovation systems.



## Annex 2. Interview Guide Sheet

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### Semi Structured Interview Guide. Revised May 2005

1. Briefly describe the history of the project – were there different project phases that should be considered together.
2. By what process was the project identified:
  - a. who identified the project – whose problem was it, etc, did it follow from needs studies, earlier work or previous relationships.
3. Which institutions received DFID funds from the project:
  - a. who are the main coalition partners in each project – how were they identified and selected;
  - b. who are the stakeholders who did not become coalition members (informal partners, paid and unpaid);
  - c. have coalition partners worked together before;
  - d. were other resources contributed by others:
    - i. 'In kind' contributions;
    - ii. Other donors ('co-funding');
    - iii. Ghana government resources;
    - iv. Private sector.
4. What is the nature of partnership (who controls budget, what are the power relations – signing off on quality etc –
  - a. what has been the changing relationship with NR International over time (covering changing power relations, responsibilities, share of budgets, roles of each partner etc);
  - b. how were these changes manifest (what drove these changes – were these changes coming from DFID);
  - c. do they perceive a change from 'traditional' research funding to the Partners for Innovation approach – do they recognise the terms, why do they think it occurred.
5. How does the DFID/CPH Programme compare with other donors from whom they receive funds (if any) now and before. Who is the 'best' donor (why).
6. What would they regard as the 'successes' of the project: initially leave open the many types of possible success, then prompt:
  - a. scientific papers (additions to the stock of knowledge);
  - b. capability development (who, how, what evidence);
  - c. building coalitions;
  - d. sustained uptake by knowledge users;
  - e. sustained uptake by 'end users' – 'beneficiaries';
  - f. changes in 'policy';
  - g. indicators of the impact in the reduction of poverty;
  - h. changes in physical and biological environment.
7. What was the uptake model – actual or implied, at outset / now. Contrast:
  - a. a 'linear dissemination model' versus
  - b. an interactive 'NSI business model' that takes up the project's results on a sustainable basis
    - i. Who developed it;
    - ii. Was it the result of the project.

8. Who performs the 'intermediate functions' necessary to interact between suppliers and users of new knowledge. And between poor people and service providers (prompt with diagram if necessary).
9. What is the condition (strengths and weakness) of the NSI system or 'enabling environment' in which the project operates (institutional and organisational capability, initial conditions etc):
  - a. is the situation improving or deteriorating;
  - b. are there 'macro effects' (drought, sector reform) that swamp the effects of the research;
  - c. the nature of formal and informal networks (improving/deteriorating).
10. Are 'capabilities' being built (and if so how – what works)
  - a. in host organisation;
  - b. in partners;
  - c. in the rest of the 'system'.
11. Do organisations behave differently now compared to when the project started – how much was this the result of this project
  - a. DFID rules or objectives changed;
    - i. what evidence / what mechanisms;
  - b. do they perceive changes to the CPH Programme's rules / objectives changed;
    - i. what evidence / what mechanisms;
  - c. the 'rules of the game' from other parts of the system.
12. If they had their time over again, how would they do things differently (what have they learned).
  - a. what would they consider to be an ideal funding arrangement (project versus core funding, funds for overheads, capacity building etc);
  - b. larger amounts for fewer projects;
  - c. direct relations with DFID/High Commission.
13. Do they need an overseas (UK) partner
  - a. what is the value added by these institutions;
  - b. do they provide value for money;
  - c. what could they contribute that they currently do not..



## Annex 3. An Impact Matrix

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The idea of the Matrix was to find a simple way to summarise a large sample of the CPH Programme's old and new projects in terms of two sets of indicators. The first set was based on the 'normal' impact indicators used in the CPH Programme's Final Technical Reports (see first Box following). The second set was indicators of the extent to which each project contains the elements of 'best practice' defined by the 'National Systems of Innovation' literature – that is its 'NSI-ness' (see second Box following)<sup>210</sup>. It was hoped that, by comparing the two sets of indicators across a large sample of projects, it would be possible to provide insights into the key task of the study as to whether the new approach is in some sense more effective than the previous, more traditional, one.

The indicators of 'NSI-ness' (henceforth 'IS scores') were designed to be cumulative, in the sense that those projects that exhibit more indicators could be said to have the greatest chance of achieving innovation. Also, they were sequential, in the sense that each indicator is easier to achieve than the indicator that follows.

While certain insights were obtained from this process, in the event, the construction of the whole matrix proved unworkable. This is described in Chapter 6.

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<sup>210</sup> Initially, the term National Systems of Innovation (NSI) was used, as this is the term used in the literature, but this was changed to Innovation Systems (IS) as the study progressed, as this better reflected innovation systems at the sub-national and project level.

*Indicators of Impact*<sup>211</sup>

1. Institutional uptake  
**What do we know about the uptake of research outputs by other intermediary organisations or projects (local, national, regional or international)? What uptake by which organisations/projects where? Give details and information sources.**
2. End-user uptake  
**What do we know about the uptake of research outputs by end-users? Which end-users, how many, and where? Give details and information sources.**
3. Impact rating – knowledge  
**What do we know about the impact of the project on the stock of knowledge? What is the new knowledge? How significant is it? What is the evidence for this judgement?**
4. Impact rating – institutional  
**What do we know about the impact on institutional capacity? What impact on which organisations, and where? Give details and information sources.**
5. Impact rating – policy  
**What do we know about any impact on policy, law or regulations? What impact and where? Give details and information sources.**
6. Impact rating – poverty  
**What do we know about any impact on poverty or poor people? What impact on how many people where? Give details and information sources.**
7. Impact rating – environment  
**What do we know about any impact on the environment? What impact and where? Give details and information sources.**
8. Impact and uptake information  
**Details and sources. What specific exercises, if any, have been undertaken to determine uptake or impact. Give references if any.**

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<sup>211</sup> These indicators were developed in consultation with Michael Flint, CPHP advisor on Monitoring and Evaluation.

*Indicators of 'NSI-ness' or IS scores*

1. Suppliers and users of 'codified knowledge' centrally involved.  
**Does the project contain organisations (or individuals) in some form of partnership<sup>212</sup> (or coalition, or strategic alliance of mutual benefit) that cover both the provision of 'codified knowledge' (usually an R&D institution) and the use of such knowledge<sup>213</sup>?**
2. User needs understood.  
**Genuine and continuous involvement of all 'end-users' (producer, consumer or processor) to assist in the determination of the initial problem and to provide iterative feedback as innovation evolves.**
3. Investment in 'system' development  
**Project involves significant expenditure in non-R&D organisations, and/or Project documentation contains an explicit objective to develop innovation system (at Project Concept, and/or Log Frame).**
4. Intermediary functions performed  
**One or more 'intermediary organisation' (or organisation that performs intermediary functions – likely to be a consulting firm, an NGO, or a CBO) actively involved in coalition to assist two-way communication between knowledge suppliers and users, and or facilitate the new use of knowledge by the end-user individuals or organisations.**
5. Financially sustainable delivery system exists  
**Innovation system contains, or explicitly develops, a financially viable (and socially and environmentally sustainable?) business model<sup>214</sup> to supply the innovative technology or service (this probably involves one or more manufacturers, service providers, credit suppliers, and providers of technical assistance to users).**
6. Learning results from iterative action research  
**Project exhibits an iterative process that enables the organisations within the system to learn and improve their performance (such a project is likely to be associated with changes in the project log frame as the diagnosis of the 'problem' improves and possible responses – 'solutions' – evolve).**
7. Pro-poor innovation takes place  
**Viable innovative use of new technologies and/or new ways of doing things observed to take place on a financially, socially and environmentally sustained basis (as a result of the project) that demonstrably improves the livelihoods of poor people. If this occurs, the innovations system clearly works effectively.**
8. Rules of the game changed  
**Project results in changes in the institutional arrangements ('rules of the game') by which the various organisations in the system operate. This might also include changes in the Framework Conditions in which the Innovation System exists.**
9. Infrastructure strengthened  
**Aspects of the infrastructure that supports and enables the innovation system to operate effectively are strengthened (not only are micro-credit organisations brought into the coalition of actors, but micro-credit services are strengthened, for example).**

<sup>212</sup> There is a huge literature on what constitutes a 'partnership': see, for instance, KFPE, Guidelines for Research in Partnership with Developing Countries: 11 principles, KFPE, Berne, Switzerland, 1998.

<sup>213</sup> Suppliers and users of codified knowledge are difficult to distinguish in practice (most organisations do both), but they do help to identify those R&D institutions (suppliers) that try to operate on their own, pushing new knowledge down an 'uptake pathway' that does not exist.

<sup>214</sup> The business model could involve extensive government subsidy, particularly to poor people – the key is that there is a delivery mechanism that is financially sound and responsive to the needs of poor people.



## Annex 4. Principal People Interviewed

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### Ghana

Dr Ben Dadzie, Regional Co-ordinator, West Africa.  
 David Crenstil, MoFA.  
 Panni Johnson, MoFA.  
 Vincent Akoto, MoFA, IMT.  
 Rexford Quaye, DFID, Ghana.  
 Paa Nii Johnson, FRI.  
 Stephanie Gallat, NRI.  
 Dr William Ellis, University of S and T at Kumasi.  
 Mr Fuseini Haruna Andan ('Prince'), MoFA Tamale.  
 James Atarigiya, MoFA Bolgatanga.  
 Chris Avoka, Ghana Broadcasting Corporation.  
 Salifu Zibilim, Bogatanga MoFA.  
 Sam Addo, Independent consultant, LGB grouping.  
 Dr Plahar, Director of the Food Research Institute.  
 Ms Emma Spicer, Deputy Director DFID, Ghana.  
 Mrs Wilhelmina Quaye, Socio-economist at FRI.  
 Joseph Gayin, Processing and Engineering Division of FRI.  
 Seidu Ali Sampare, Engineering Department, FRI.  
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### Kenya

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 Eston Murithi, Kendat.  
 Chairs of 'Community Parliaments', namely, John Njongoro, Chair of Mwea Transport and Marketing Organisation; Lennox Barasa, Busia Integrated Agriculture and Marketing Forum; Philip Kilaki, Kalama Donkey Users Association.  
 Peter Njenga, IFRTD.  
 Rahab Mundara, ITDG.  
 William Gachanja, Zuzuka Ltd, three-wheeled motor bikes.  
 Stephen Muthua, ASSIST, ILO.

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 Mr Brighton Sinkala: District Health Management Team.  
 Mr Abraham Chiwana, Economist, Ministry of Trade And Industry.

Mr Albert Nsonda, Environmental Health Officer, Lusaka City Council.  
Ms Alinesi Chakwinja, NISIR.  
Josephine Mulenga, Environmental Health Officer, Lusaka City Council.  
Mrs Avet Hakalims, Environmental Health Officer, Lusaka City Council.  
Mr Fordson Nyaenda, Central Board of Health, Environmental Health Specialist.  
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Henry Gadaga, University of Zimbabwe.  
Cabinet C Musuna, Kutsaga Research Station.  
Paulina R Zindi, Government Analyst Laboratory.  
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Dr Rajeswari S Raina, NISTADS.  
Guru Naik, Livelihood Solutions.  
Ravi Agarwal, Toxic Link.  
Dr Madhoolika Agarwal, Botany Department, Banaras Hindu University, Varanasi.  
Dr Kevin Crockford, Senior Rural Livelihood Advisor, DFID Office New Delhi.

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C P Raman, ex-Director of the IGMRI.

Jaya Raj, IGMRI.

Dr Farid Waliyar, ICRISAT.

Raghunadha Reddy, Visiting Scientist, ICRISAT.

A Bhavani Prasad, Vice President of the Federation of Farmer Associations.

Dr V L K Prasad, Prof and Head of the Department of Livestock Production and Management at ANGRAU University.

Mr C L N Rao, MD Janaki Feeds Pvt Ltd.

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Arthur Musoke, BUCADEF.  
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Simon Jerimia, LZARI.  
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Appia Mkoba, CARE International.  
David Selby, Director, CARE International.

### **UK**

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Dr P Golob, Post-Harvest Technology, PAC Member, Independent.  
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